Secondary Distribution Switchgear

FBX

SF6 Gas-insulated switchboards

Instructions
Installation - Commissioning

Schneider Electric

Contents

1 Schneider Electric at your service 1
1.1 Particular instructions for operations and interventions 1
1.2 Protection equipments 1
1.3 Symbols of information 1
1.4 Symbols and important safety informations 1
1.5 Contacts 1

2 With regards to this User Manual 2
2.1 Reminder concerning normal service conditions (in accordance with IEC62271-1) 2
* Permissible ambient temperature 2
* Installation altitude 2
* Atmospheric pollution 2
* Permissible atmospheric humidity level 2
2.2 Other technical notices to be consulted 2
2.3 Tools and products (not supplied) required for the operations described in this notice 2
2.4 Tightening torque values [Nm] for standard assemblies (nut + bolt) 3

3 Presentation 4
3.1 Identification of the FBX 4
3.2 Presentation of the FBX 5
3.3 Presentation of “Measurement” functions 6
3.4 Legend of mimic diagrams for manual controls 6
3.5 Presentation of mimic diagrams (See legend § 3.4) 7
3.6 Presentation of mimic diagrams for motorised controls (See legend § 3.4) 8
3.7 Presentation of the mimic diagrams used on 'Measurement' functions' (See legend § 3.4) 8

4 Storage - Packing 9
4.1 FBX switchboard packing 9
4.2 Specific transportation requirements 9
4.3 Temporary storage – less than 6 months 9

5 Handling and Unpacking 10
5.1 Reminder 10
5.2 Unpacking 10
Valorizing packaging waste 10
Delivery cable blanking plate (option) 10
5.3 Handling 10
Special case for 5 function switchboards 10
5.4 Packing 10

6 Fixing to the floor 11
6.1 Opening the cable compartment cover 11
6.2 Fixing to the floor 11

7 Earthing the FBX switchboard 12
7.1 Location of the connector terminal 12
7.2 Connecting the earthing cable 12

8 Connection of the HV cables 13
8.1 Standard equipment for the FBX – up to 24 kV 13
8.2 Connection adapter cones for cross-members in accordance with NF-EN50181 13
8.3 Connection of the cables 13
8.4 General connection precautions 13
8.5 Type A connection 13
8.6 Type C connection 14
8.7 Attaching the cables and connecting the earthing braids 14
Clip-fit clamps 14
Screw-fit clamps 15
8.8 Fitting of cables with a blanking-off flooring (optional) 16
8.9 Assembly of 3 cables per phase (optional) 17
8.10 Access to the connections for the 25 kA cables (optional) 18
8.11 Fitting one or two cores per phase (option) 18

9 Switchboard extensions for simple extension (SE) or double extension (DE) 19
9.1 Intervention levels 19
9.2 Intervention Instructions 19
9.3 FBX switchboard lockout 19
9.4 Connecting a 1250 A busbar 19
9.5 Reminder on the use of blanking plugs 19
9.6 Coupling accessories 20
A box, containing: 20
Additional supplies 20
9.7 Equipment for the Functional Unit extension (See § 9.6) 20
9.8 Extendable switchboard equipment (See § 9.6) 21
Preparation the existing extensible unit (Version after 03/2008) 22
Preparation of the insulated extension connectors (5) 23
Installation of the insulated extension connectors (5) 23
Preparation the existing extensible unit (Version before 04/2008) 23
Preparation of the extension unit 24
9.9 Switchboard assembly 24
Fixing to the floor and connecting 25

10 Fitting a protective cover (Function M Only) 26
10.1 For a LHS coupling 26
10.2 RHS coupling 26

11 Fitting a rear deflector to a Function M 27
11.1 When required 27
11.2 Fitting the deflector to the rear of the Function M 27

12 Connecting transformers within Measurement Functional Units 28
12.1 General 28
12.2 Connecting transformers in a type M2 or M3 functional unit 28
12.3 Connecting transformers in a Type M4 fonctional unit 28

13 Low Voltage Connections 29
13.1 Intervention conditions (See § 9.1) 29
13.2 Connection of the low voltage wiring 29
13.3 Circuit diagrams 30
13.4 Shunt tripping coil 30
13.5 Standard diagram for motorized control (type AB2) for Function C 30
13.6 Standard diagram for motorized control (type AB3) for Function C 31
13.7 Standard diagram for motorized control (type AB2) for Function T1 32
13.8 Standard diagram of a WIC1 protection (type AB3) for Function T2 33
“Measure - protection - signalling” part 33
“Control” part 34

14 Connecting the FBX to the T200I control unit 35
14.1 Connecting a 630A CB Functional Unit 35
14.2 Connecting a C (AB2) Functional Unit 35
14.3 Connecting a C (AB3) Functional Unit 36
14.4 Connecting Functional Units C (AB2) and T1 (AB2) 36
14.5 Connecting Functional Units C (AB3) and T1 (AB3) 36
14.6 Connecting a T2 (AB2) Functional Unit 37
14.7 Connecting a T2 (AB3) Functional Unit 37

15 Fitting the HV fuses 38
15.1 Dimensions (mm) of the fuses – in accordance with standards IEC60282-1 and IEC62271-105 38
15.2 Selection table for fuses 38
Schneider Electric fuses (Flusarc-CF - CEI) 38
Schneider Electric fuses (Flusarc-CF - DINVDE) 38
SIBA fuses (HH-DIN) 39

Contents

15.3 Fitting a fuse [earthing switch closed] . . . 39
Open the access cover to the standard fuse holders . . . 39
Opening of the access cover to the leaktight fuse holders (by key or handle) 39
Fitting the fuses in place . . . 40
Processing fuse packaging . . . 41
15.4 Mechanical trip test on blown fuse . . . 41

16 Protection Relays WIC1 or DPX-1 . . . 42
16.1 Location of the protection relays . . . 42
16.2 Access to the relays of a single T2 function (See markings in § 16.1) . . . 42
16.3 Setting of the protection relays . . . 42
16.4 The protection relays WIC1 & DPX-1 . . . 43
16.5 Fault indicator WI1-SZ5 . . . 43

17 Commissioning . . . 44
17.1 Reminder . . . 44
17.2 Carry out an inventory of all tools and accessories on completion of the work 44
17.3 Pre-commissioning information . . . 44
17.4 Principle pre-commissioning checks . . . 44
17.5 Energizing the FBX switchboard . . . 44
17.6 VDS – Voltage Detection Systems . . . 45
HR System (High Resistance) . . . 45
IVIS (Intelligent Voltage Information System) . . . 45
Verification of phase concordance (for IVIS) . . . 45
Capdis KRIES . . . 46
17.7 VPIS (Voltage Present Indicating System) . . . 46
Voltage Present Indications verifications with a standard unit . . . 46
Voltage Present Indications verifications with a Kries unit . . . 47
17.8 Starting up the switchboard . . . 47
17.9 Short-circuit indicators (optional) . . . 47

18 Notes . . . 48

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Schneider Electric request the carefully reading of the following instructions in order to familiarize yourself with the product in this document before trying to install, operation, put into service or conduct the maintenance on it.

Our products are fully quality controlled and tested at the factory in accordance with the standards and regulations currently in force.

The correct functioning and lifespan of the product depend on respecting the installation, commissioning and exploitation instructions found in this manual. Not respecting these instructions is likely to invalidate any guarantee.

Local safety requirements which are in accordance with these instructions, especially those regarding the safety of product operators and other site workers, must be observed.

Schneider Electric declines any responsibility for the following points:
- the non respect of the recommendations in this manual which make reference to the international regulations in force.
- the non respect of the instructions by the suppliers of cables and connection accessories during installation and fitting operations,
- possible aggressive climatic conditions (humidity, pollution, etc.) acting in the immediate environment of the materials that are neither suitably adapted nor protected for these effects.

1.1 Particular instructions for operations and interventions

This user manual does not list the locking-out procedures that must be applied. The interventions described are carried out on de-energized equipment (in the course of being installed) or locked out (non operational).

Whilst commissioning and operating the product all general safety instructions for electrical applications (protective gloves, insulating stool, etc.) must be respected, this in addition to the standard operating instructions.

All operations must be completed once started.

The durations (for completing the operations mentioned) given in the maintenance tables are purely an indication and depend on on-site conditions.

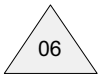
1.2 Protection equipments

Only qualified and accredited people can operate on our products. They must be equipped with all the correct protective equipment required for the task being performed.

A qualified person is one who has the skills and knowledge related to the construction, installation and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Except when it is imposed, the wearing of the gloves has been voluntarily limited in this manual so as to have clear visuals of the hands and operations described.

1.3 Symbols of information



Code for a product recommended and marketed by Schneider Electric

Tightening torque value
Example: 21 Nm

Mark corresponding to a key

1.4 Symbols and important safety informations

The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this signal word.

1.5 Contacts

Group Schneider Electric service centers are there for:

- Engineering and technical assistance
- Commissioning
- Training
- Preventive and corrective maintenance
- Spare parts
- Adaptation work

Schneider Electric Energy France

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www.schneider-electric.com

2 With regards to this User Manual

2.1 Reminder concerning normal service conditions (in accordance with IEC62271-1)

* Permissible ambient temperature

The ambient air temperature should be comprised between - 5° C (on option -15 or -25°C) and + 40° C.

The mean measured value for a 24 hour period must not exceed 35°C.

* Installation altitude

HV equipment is defined in accordance with European Standards and can be used up to an altitude of 1,000 m.

Beyond this, account must be taken of the decrease in dielectric withstand.

For these specific cases, contact the Schneider Electric Sales Department.

* Atmospheric pollution

The ambient air must not contain any dust particles, fumes or smoke, corrosive or flammable gases, vapours or salts.

* Permissible atmospheric humidity level

The average atmospheric relative humidity level measured over a 24-hour period must not exceed 95%.

The average water vapour pressure over a period of 24 hours must not exceed 22 mbar.

The average atmospheric relative humidity value measured over a period of one month must not exceed 90 %.

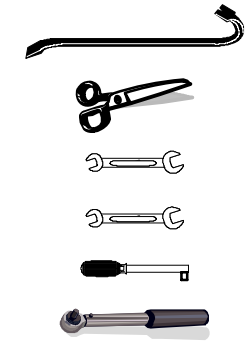
The average water vapour pressure over a period of one month must not exceed 18 mbar.

2.2 Other technical notices to be consulted

■ AMTNoT110-02	FBX	Guide to Civil Engineering Work
■ AMTNoT132-02	FBX	Operations - Maintenance
■ AMTNoT137-02	FBX	Handling - Storage
■ AMTNoT150-02	FBX	Assembly on an internal arc channel
■ AMTNoT153-02	FBX	Mechanical key-type interlocking Assembly-operation
■ AMTNoT161-02	DPX-1	Self Powered Relay
■ AMTNoT164-02	FBX-E	Handling of Coupled Functional Units
■ AMTNoT170-02	FBX CB function	Installation - Commissioning - Operation - Maintenance
■ AMTNoT174-02	FBX	Assembling a 1250A busbar
■ AGS531751-01	IVIS and IVIS-F	Operating Instructions
■ AGS531757-01	IVIS and IVIS-F	Installation Instructions

2.3 Tools and products *(not supplied)* required for the operations described in this notice

- Crowbar
- Scissors
- Open-ended spanners sizes 7, 13 and 17
- 2 x open-ended spanner - size 16
- Ratchet handle + extension with socket sizes 8, 10, 13 and 16 mm
- Torque wrench



2.4 Tightening torque values [Nm] for standard assemblies (nut + bolt)

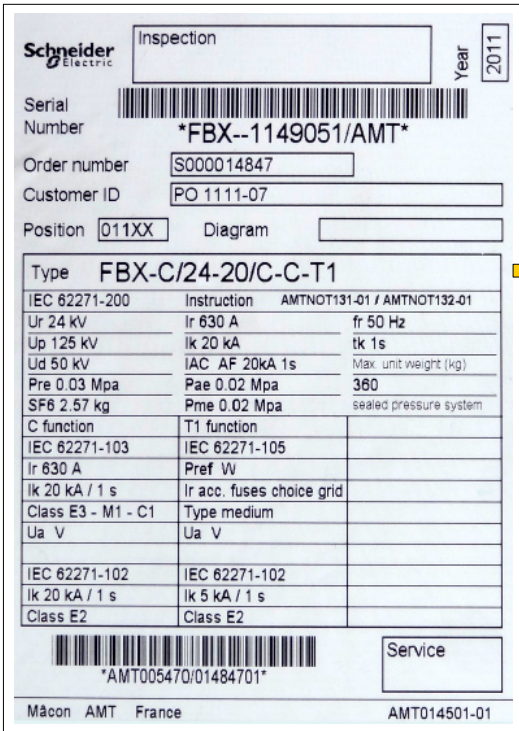
Diameter	Plastic (PA 6.6)	Steel Class < 8.8	Steel Class ≥ 8.8 ≤ 10.9	Threaded fasteners with grease A2-70
M 6	0.8	4.3	8.8	6.6
M 8	1.8	10.5	21.0	15.8
M 10	3.5	14.0	42.0	35.0
M 12	6.0	-	70.0	60.0
M 16	12.0	-	170.0	134.0

3 Presentation

This manual covers FBX-C and FBX-E switchboards for 12, 17,5 and 24 kV networks.

3.1 Identification of the FBX

The technical data ranges give the individual characteristics of the switchboard.



FBX-C / 24-20 / C-C-T1

Switchboard

Type:
C = Compact
E = Simple Extendable (SE)
Double Extendable (DE)

Rated voltage:
24kV

Short circuit current rated: 20kA

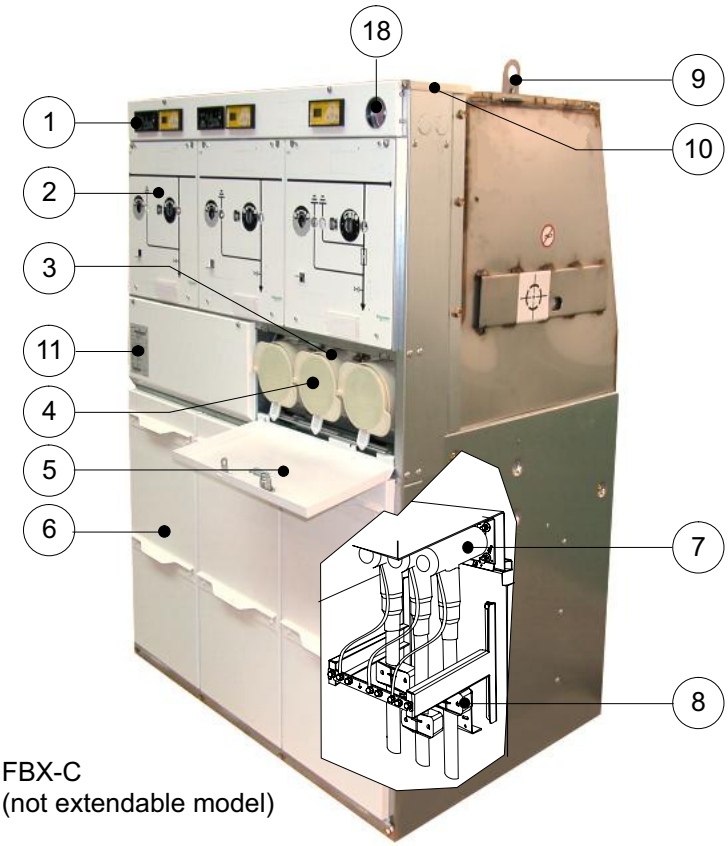
Functions making up the switchboard

C	= Load-break switch
T1	= Combinated or associated fuse and load-break switch
T2	= Transformer protection circuit breaker
CB	= Outgoing feeder protection with vacuum circuit-breaker
CBb	= Busbar protection with vacuum circuit-breaker
R	= Direct linkage
RE	= Direct incoming feeder with earthing switch
M1	= Measurement with cable connections
M2	= Measurement - for RHS extension
M3	= Measurement - for LHS extension
M4	= Measurement - for extension (Left or Right)
Sb	= Busbar disconnector

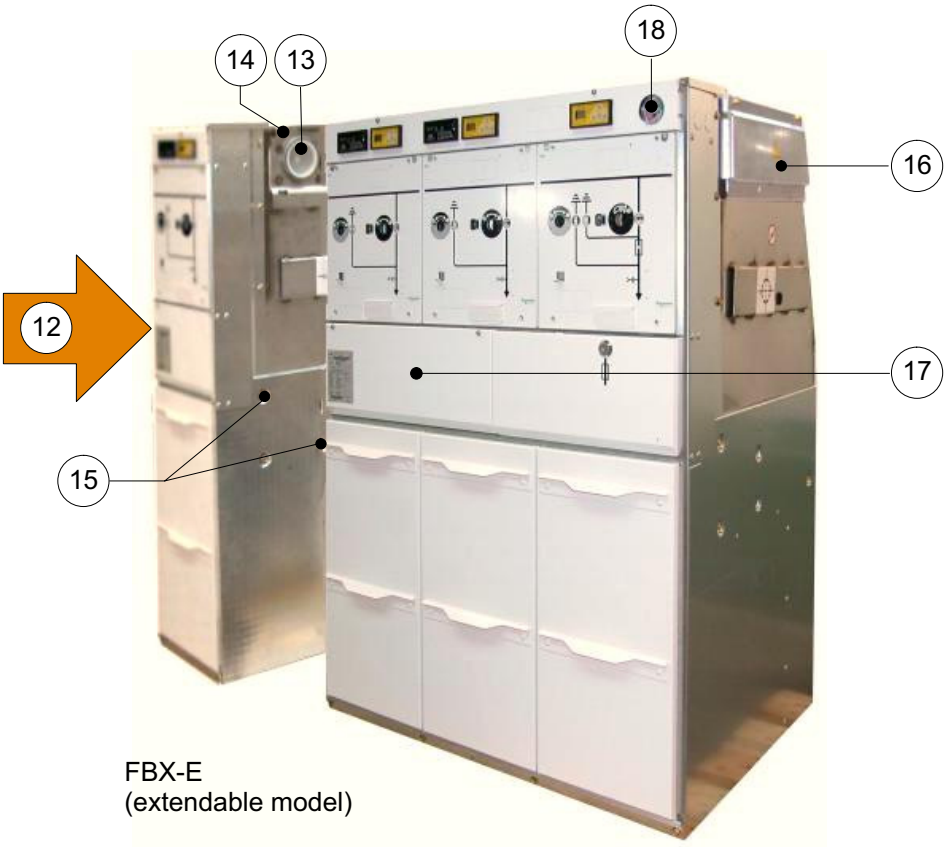
3.2 Presentation of the FBX

Legend

- *1 Voltage presence indicator light and low voltage compartment panel*
- *2 Mimic diagram panel*
- *3 Fuse compartment*
- *4 End plug*
- *5 Fuse compartment access panel*
- *6 Cable compartment cover*
- *7 HVA connections*
- *8 Adjustable cable mounts*
- *9 Lifting ring*
- *10 Removable top panel - low voltage connections*
- *11 Technical data rating plate*
- *12 Functional Unit - Extension*
- *13 Bus bar connector*
- *14 Functional Unit - Top Coupling*
- *15 Functional Unir coupling Points*
- *16 Extension system access panel*
- *17 Blanking panel*
- *18 Manometer*

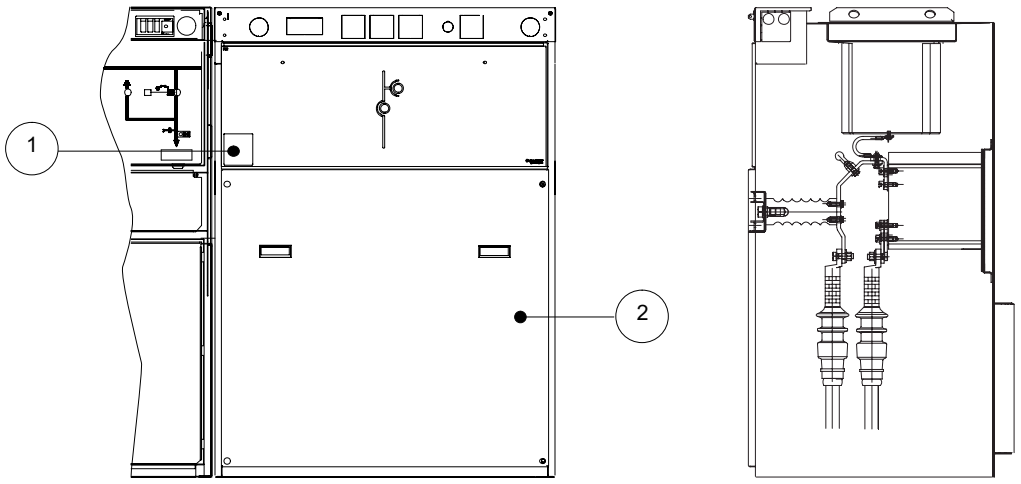


FBX-C
(not extendable model)



FBX-E
(extendable model)

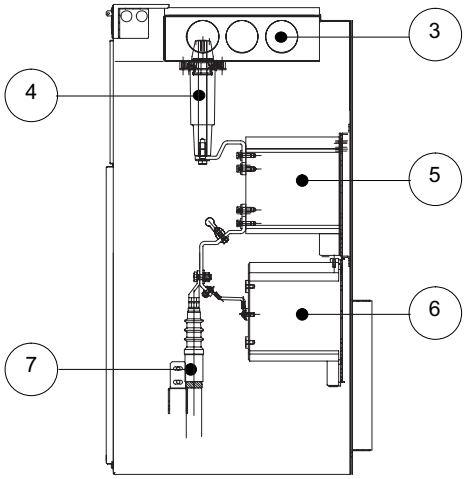
3.3 Presentation of “Measurement” functions



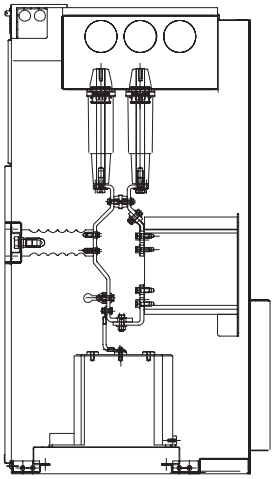
Function M1: Cable connection

Legend

- *1 Technical data rating plates*
- *2 Bolted panel*
- *3 Bus bar connector*
- *4 Bushing*
- *5 Current transformer*
- *6 Voltage transformer*
- *7 HVA connections*



Function M2 or M3
For right or left Extension



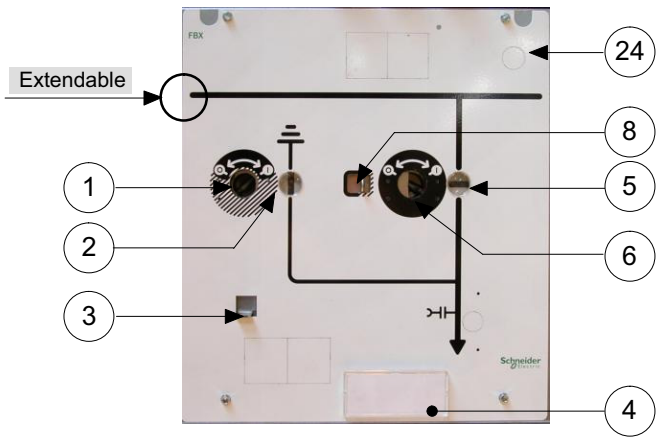
Function M4
Right or left hand side Extension

3.4 Legend of mimic diagrams for manual controls

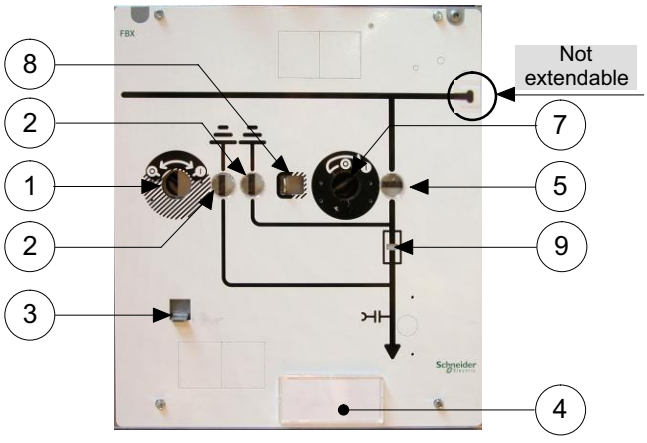
Legend

- *1 Lever socket for the earthing switch*
- *2 Earthing switch position indicator*
- *3 Cable compartment cover latch*
- *4 Descriptive plate*
- *5 Load-break switch position indicator*
- *6 Lever socket for the load-break switch*
- *7 Lever socket for the load-break switch*
- *8 Load-break switch or disconnector locking latch*
- *9 Fuse blown indicator*
- *10 Circuit breaker position indicator (O and I)*
- *11 Lever socket for the circuit breaker*
- *12 Circuit breaker locking latch*
- *13 Position indicator “primed-released”*
- *14 Fault Trip indicator*
- *15 Disconnector locking latch*
- *16 Disconnector position indicator*
- *17 Lever socket for the disconnector*
- *18 Technical data rating plate*
- *19 Voltage transformers*
- *20 Current transformers*
- *21 Cable connections*
- *22 Busbar connections*
- *23 Location of the backup handle (load-break switch or circuit breaker)*
- *24 Operations counter (optional)*
- *25 Tripping push button*
- *26 Closing push button*

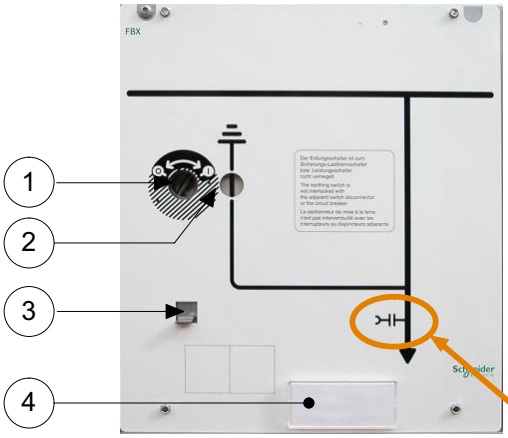
3.5 Presentation of mimic diagrams (See legend § 3.4)



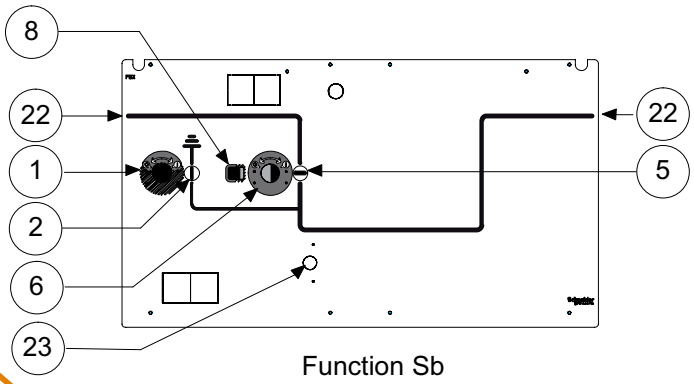
Function C “extendable”



Function T1 “not extendable on right”

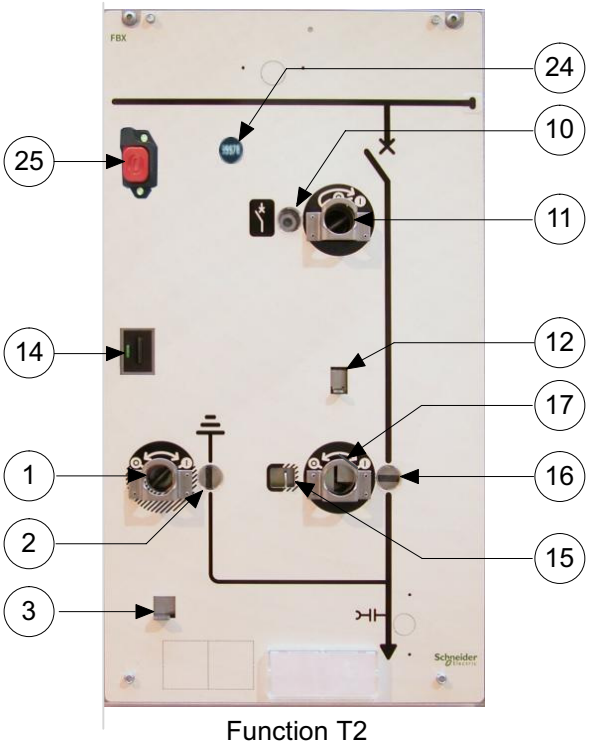


Function RE

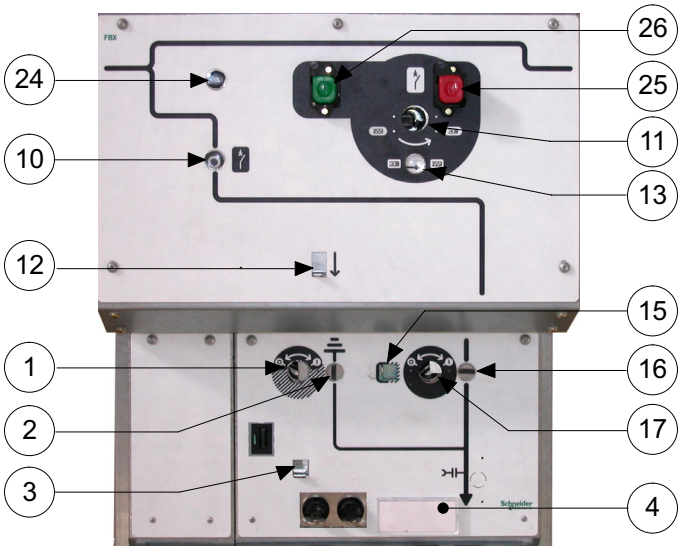


Function Sb

Indicator light system

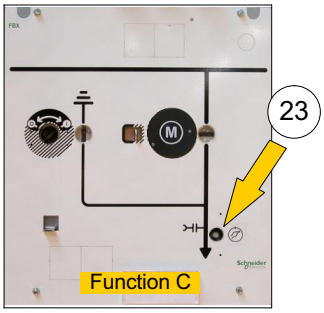


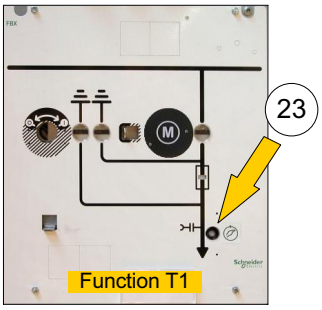
Function T2

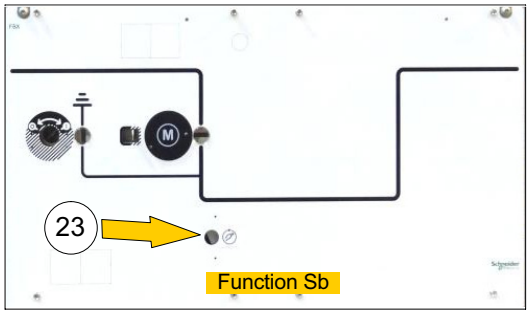


Function CB

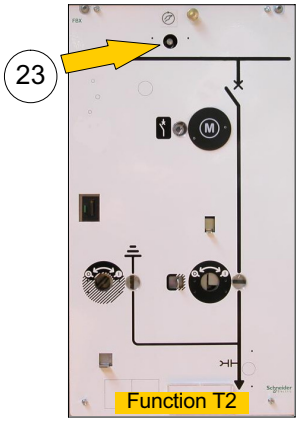
3.6 Presentation of mimic diagrams for motorised controls (See legend § 3.4)





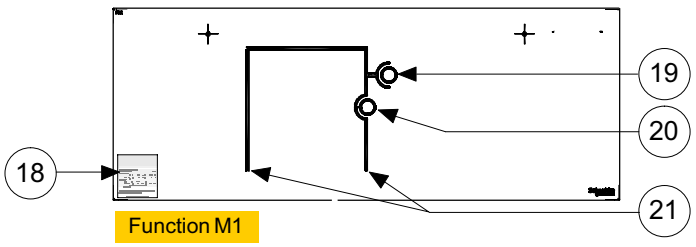


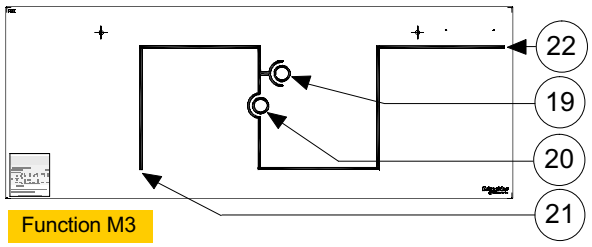
- Socket to insert the emergency manual load-break switch operating handle.

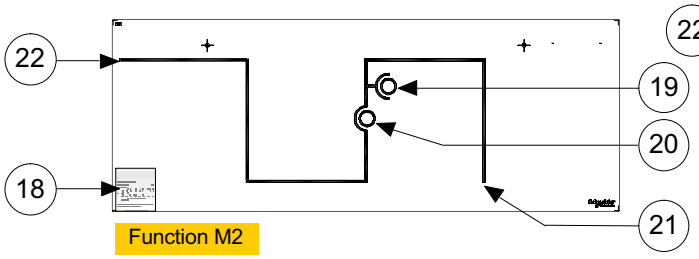


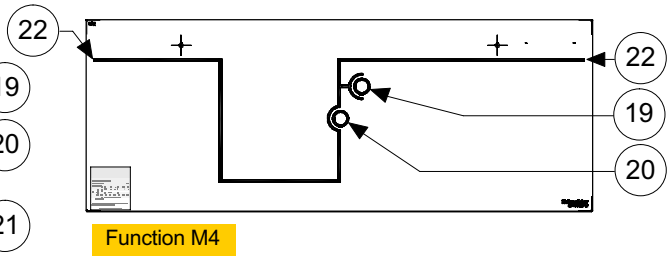
- Socket to insert the emergency manual control for the circuit-breaker.

3.7 Presentation of the mimic diagrams used on 'Measurement' functions' (See legend § 3.4)





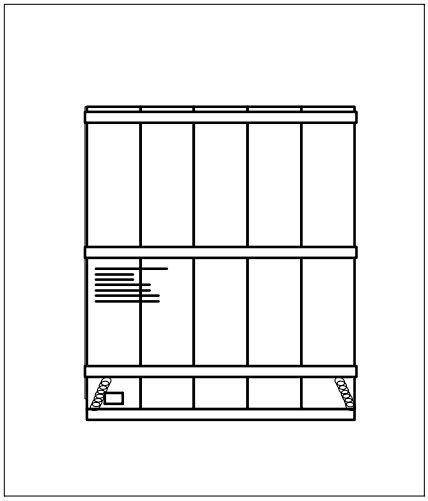




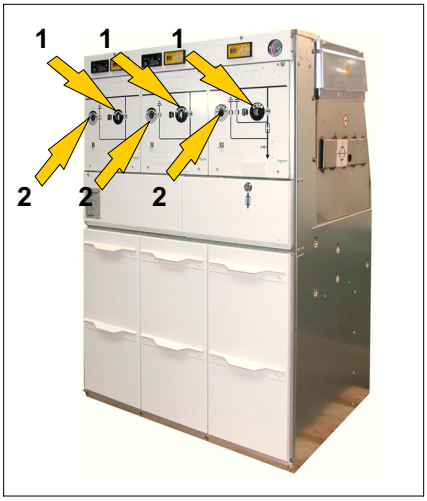
4 Storage - Packing

4.1 FBX switchboard packing

■ For road and rail transport:
- attached to the pallet using two plastic ribbon strips,
- covered by a protective plastic film.



■ The packaging of a Functional Unit for air and maritime transport:
- under a heat-sealed cover with bags of desiccant,
- packed in wooden crates.



■ Status of the equipment on delivery:
1. load-break switches, disconnectors and circuit breakers all `open', mechanical control 'disarmed',
2. Earthing switch `closed'.

4.2 Specific transportation requirements

Ensure the FBX switchboard cannot slide or tip. If necessary, nail or chock the transport pallet in place on the truckbed.

Leave the FBX switchboard in its original packing until it arrives on-site ready for installation.

NOTICE

Respect the instructions given on the sheet attached to the front panel of the switchboard.

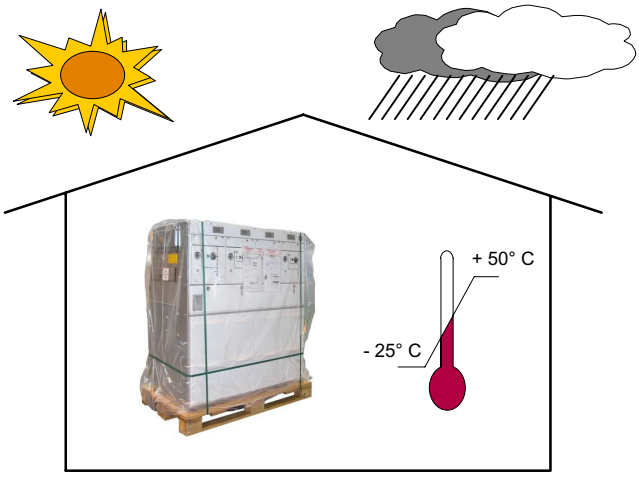
⚠ WARNING

Reminder: For air transport, all FBX switchboards must always travel in pressurized cargo compartment.

4.3 Temporary storage – less than 6 months

When the switchboard is not installed on delivery it can be stored for a period not exceeding 6 months under the following conditions:
. Preserve the equipment in its original factory packaging.
. Any parts unpacked for testing should then be repacked in their original packing.
. The site chosen for storage must be capable of protecting the material against possible damage due to: water, water vapour, saline atmospheres, all types of pollution, micro-organisms.

Contact Schneider Electric for any derogations to these criteria or for storage durations of greater than 6 months



5 Handling and Unpacking

5.1 Reminder

CAUTION

The FBX switchboard must remain on its pallet, within its original packaging during any eventual storage period and until it arrives at the location of its installation.

5.2 Unpacking

Proceed with unpacking the Functional Units only where they are to be installed on site.	Tools required: - Cutter for road and rail transport packaging - Crowbar for air and sea transport packaging	Use suitable protective gloves for any handling operation.

Valorizing packaging waste

After unpacking, the materials remaining (cover, wooden floor panel, etc.) should be sorted and sent to the appropriate recycling services.

Delivery cable blanking plate (option)

This plate is not fitted into the switchboard. It is delivered upside down, wedged in place between the transport pallet and the switchboard.

See § 8.8 for installation.

5.3 Handling

After unpacking, the switchboard must be handled in accordance with the requirements laid out in AMTNoT137-02. The latter document must, systematically, be attached visibly to the FBX itself.

Special case for 5 function switchboards

■ The 5 function switchboard must be lifted by 4 lifting brackets, until it arrives at its final installation location.

■ When the switchboard is installed, it is possible to remove the 4 lifting brackets (2 x open-ended spanner - size 13).

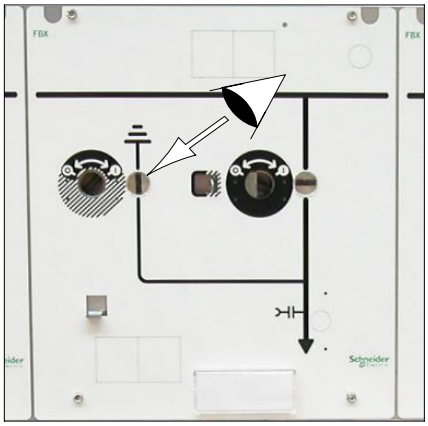
5.4 Packing

The standard pack includes the installation, user and maintenance manuals and the operating handles.

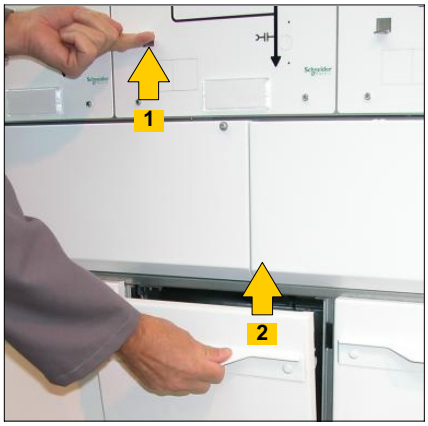
Other accessories may be included depending on the configuration of the switchboard itself (fuses, fixings, panels, etc.).

6 Fixing to the floor

6.1 Opening the cable compartment cover

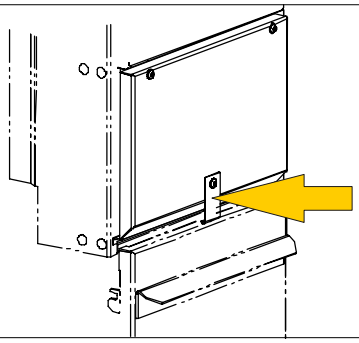


- The earthing switch must be closed (if not - see the operating manual - § 2.2).



- 1 - Lift the latch.
- 2 - Lift and pull the cable compartment cover.

- 3 - Pull the panel towards yourself then extract it.



Exception for Functions R and Sb:
Before removing the panel, remove the locking pin, fixed in place with an M6x16 CBHC bolt.

When re-fitting the cable compartment cover, re-position this locking pin then attach it with the M6x16 CBHC bolt.

6.2 Fixing to the floor

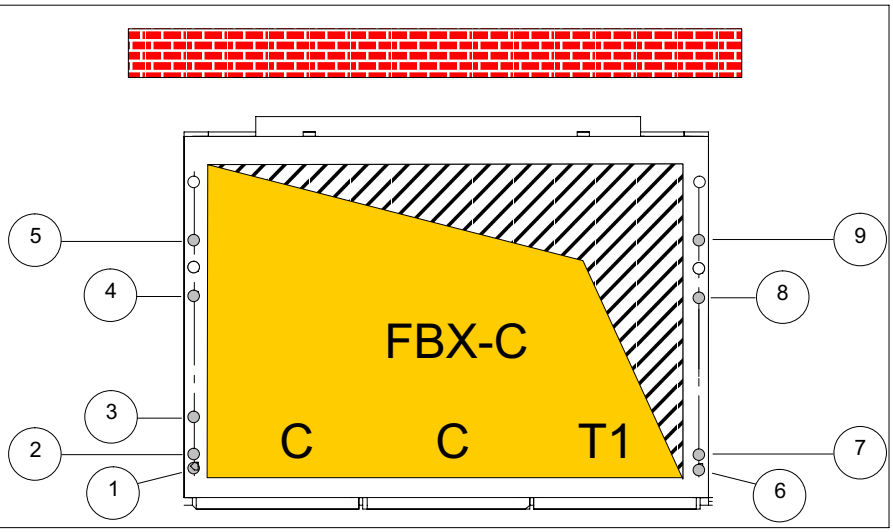
Position and fix the FBX switchboard to a concrete floor or supporting surface using 4 x M10 bolts (Class 8.8) with flat washers (exterior diameter – 30 mm, thickness – 3 mm). For rear fixings, there are two possible settings.

Ensure the unit is no way deformed when fixing to the floor. Chock it in place if necessary.

Top view

(See Civil Engineering Guide - § 2.2).

Fixing	Fixing points	Tightening
Standard	1 or 3 ; 4 ; 6 ; 8	40 Nm
Optional	2 ; 5 ; 7 ; 9	
FBX-M	1 ; 4 ; 6 ; 8	



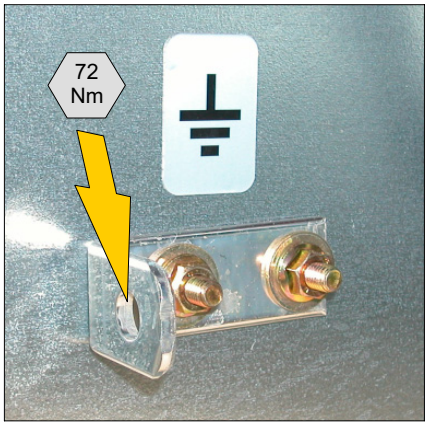
7 Earthing the FBX switchboard

7.1 Location of the connector terminal

- The earthing connector terminal can be found in the FBX unit's cable compartment on the LHS side panel.

7.2 Connecting the earthing cable

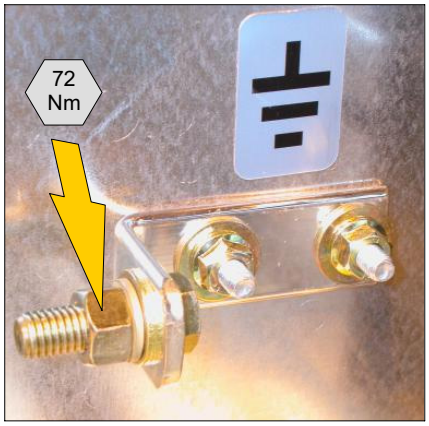
- Lightly clean the contact surfaces.



- Connect the earthing terminal to the building's grounding network (HM12 bolt).

NOTICE

The grounding network connection cable and fixings are not supplied by Schneider Electric.

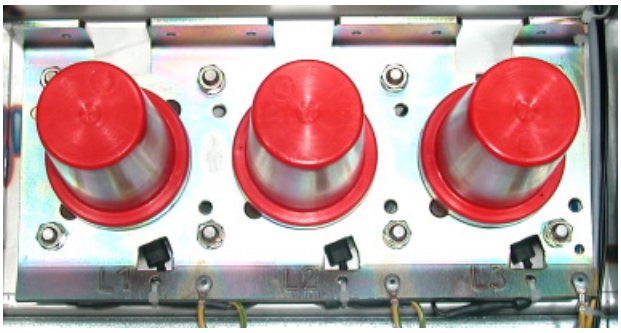


- Optional: Supply of a H M12x35 bolt.

8 Connection of the HV cables

8.1 Standard equipment for the FBX – up to 24 kV

The FBX switchboard is fitted with plug-in cross members – Type PF250 or PF630.



C / T2 / CB / T1 (optional):
Plug-in cross member PF630
NF-EN 50181, Connector - Type **C**
(Ir: 630 A ; ∅ M16 $^{0}/_{-0.04}$ mm)

T1 (basic):
Plug-in cross member PF250
NF-EN 50181, Connector - Type **A**
(Ir: 250 A, contact finger
∅ M7.9 $^{+0.02}/_{-0.05}$ mm)

8.2 Connection adapter cones for cross-members in accordance with NF-EN50181

Switchboard function	R/RE	C	T1	T2	CB
Connection adapter cone – Type **A** (250 A)	...	...	**X**	...	...
Connection adapter cone – Type **C** (630 A)	**X**	**X**	**X**(optional)	**X**	**X**

8.3 Connection of the cables

The cable compartments can be accessed from the front.

Remove the cable compartment access panels (See chapter 6.1).

⚠ CAUTION

Before fitting, read and apply the appropriate safety instructions.

⚠ CAUTION

Fit insulating blanking plugs on any unused cross members.
Note: The red coloured plugs fitted to the switchboards when they are delivered are not isolating plugs.

8.4 General connection precautions

⚠ CAUTION

The manufacturer's installation instructions (and torque settings) must be scrupulously respected.

Clean the separable connectors and cross members using a dry cloth.

Apply the silicon grease supplied with the connectors.

8.5 Type A connection

Position and engage the cable into its clamping stirrup.

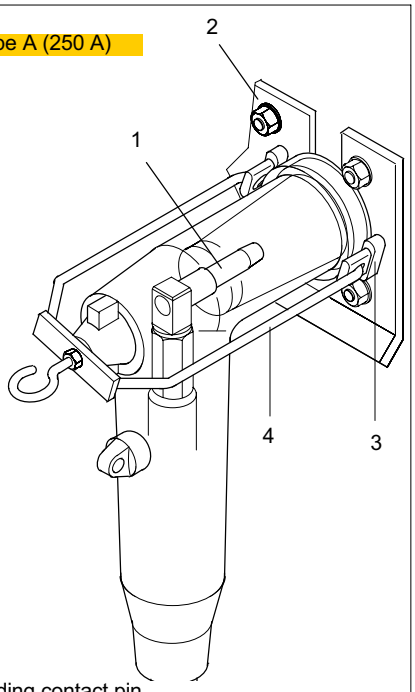
Plug in the connector without using tools then hand-tighten the fixing device. For the initial connection, and in accordance with the recommendations made by certain suppliers, it is standard to use the wires supplied with the connector to fill in the space between the cross member and the connector itself. During this connection operation, the cable must run freely and naturally into the bottom of its connector stirrup.

8.6 Type C connection

Please refer to the connector manufacturer's instructions, especially regarding the tightening torque value.

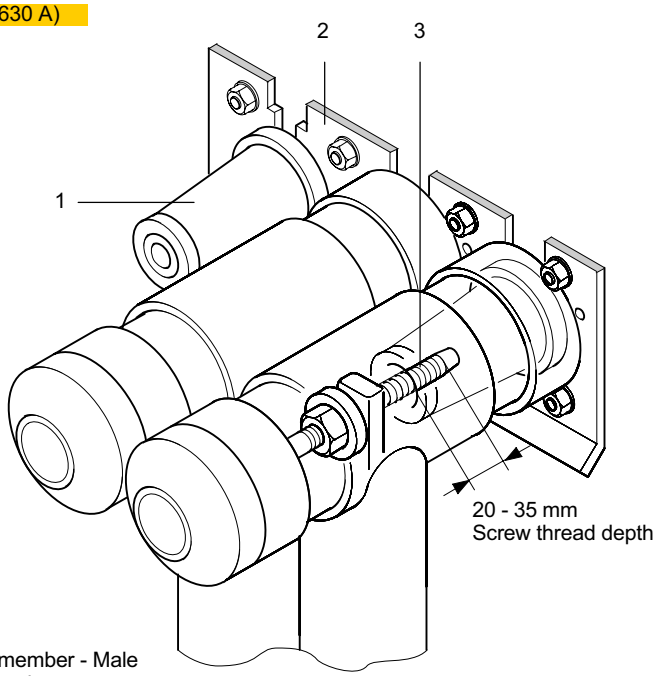
As an indicator, the maximum permissible tightening torques are 40 Nm for brass fasteners and 84 Nm for steel fasteners.

Type A (250 A)



1 - Sliding contact pin
2 - Support plate
3 - Mounting flange
4 - Mounting device

Type C (630 A)



1 - Cross member - Male
2 - Support plate
3 - Screw contact

8.7 Attaching the cables and connecting the earthing braids

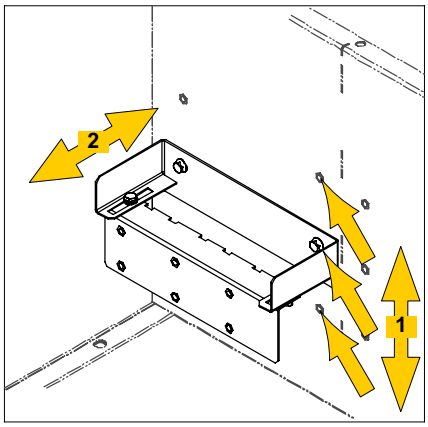
Position the adjustable cable mountings in accordance with the type of tightening (see below) and cable characteristics.

Adjustments are both horizontal and vertical.

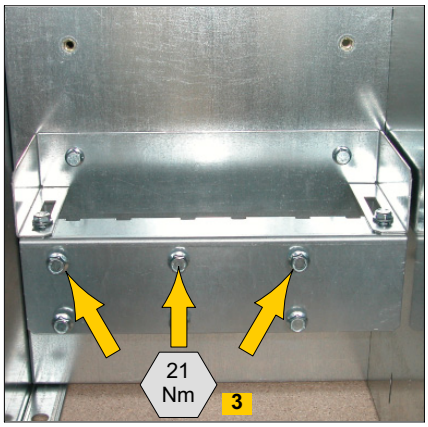
⚠ CAUTION

Attach the cables using clamps or stirrups, ensuring that no stress or tensile forces are applied to the plug-in cross member.

Clip-fit clamps



■ Assembly 1 cable per phase:
1- Height adjustments using three fixed positions.
2- Depth adjustment using the two lateral slides.



■ Mountings for the cable supports for clip-on clamp fixing.
3- Three M8 fixing screws for the cable earthing braids.

■ Fitting the clip-on clamps.

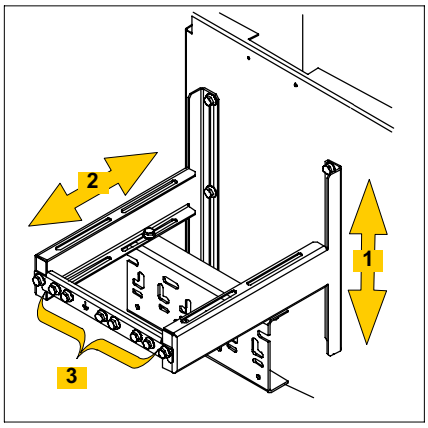
Screw-fit clamps

NOTICE

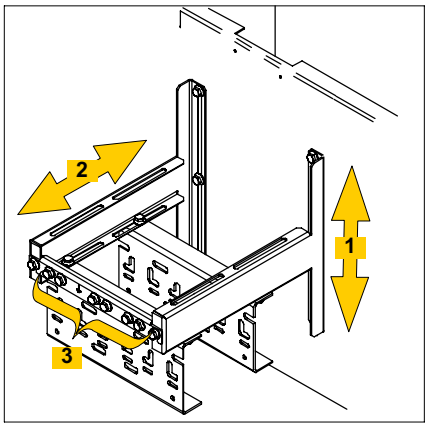
This clamping is obligatory for a 2 cable per phase (or 1 cable + surge arrestor) installation.

⚠ CAUTION

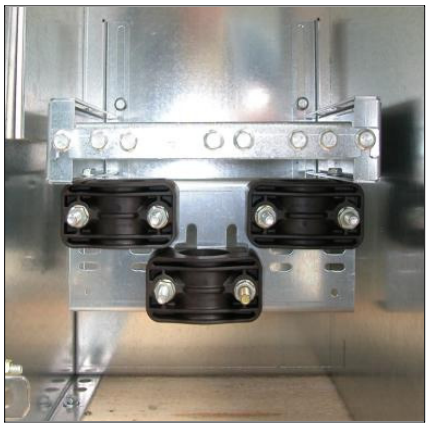
Pay careful attention to the choice of connectors as the compartment depth is extremely limited.



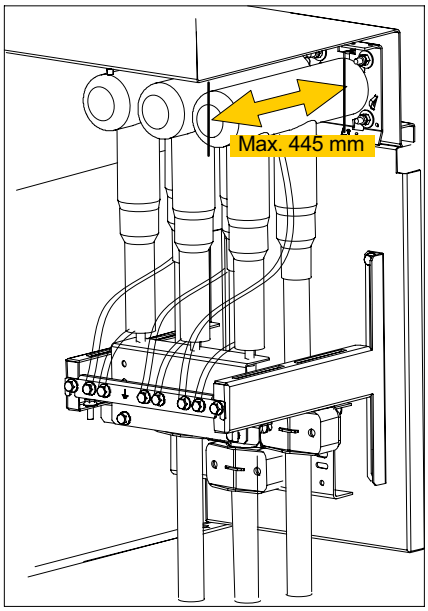
■ Assembly - 1 cable per phase:
1- Height adjustments.
2- Depth adjustment.
3- Fixation points for the cable earthing braids:
- Standard screw size: H M8 — 21 Nm
- Optional screw size: H M10 — 30 Nm



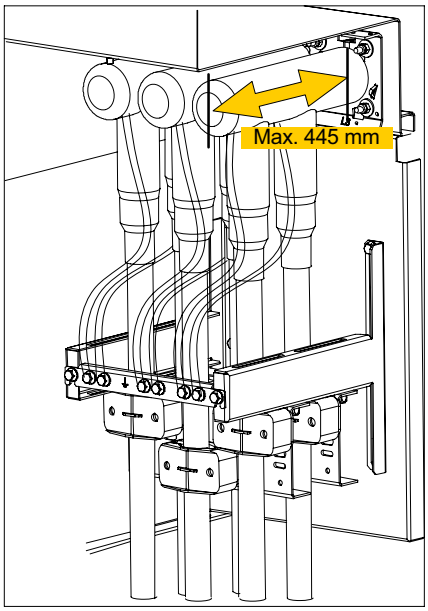
■ Assembly of 2 cables per phase:
3- Six M8 fixing screws for the cable earthing braids:
- Standard screw size: H M8 — 21 Nm
- Optional screw size: H H M10 — 30 Nm



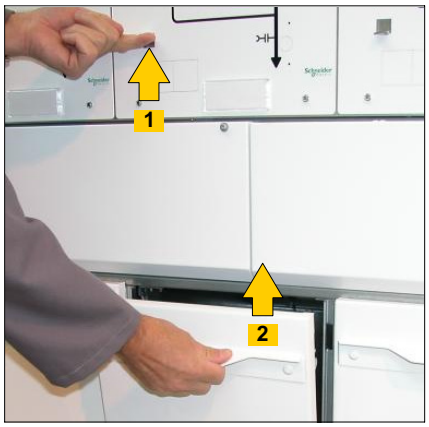
■ Cable clamp for C function.



■ Connection of single cables + surge arrestors.



■ Connection of two cables per phase.



■ To replace the cable compartment cover:
1- The tab of the interlock has to be in its upper position.
2- Replace the cover in the holes provided and then push down, make sure the tab of the interlock drops down again.

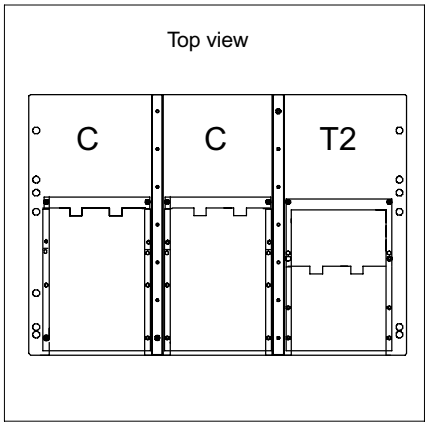
Mounting plates are required for the fitting of the surge arrestor fixings and cable supports.

These plates can be ordered from Schneider Electric.

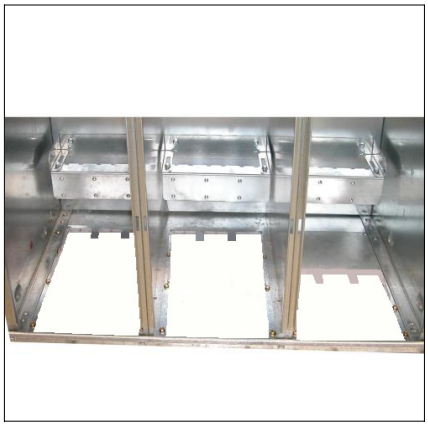
⚠ CAUTION

Reminder: The clamps are sufficient to resist the electro-dynamic forces generated by the passage of a short circuit current but are not guaranteed to provide sufficient support to authorise operators to handle them once connected.

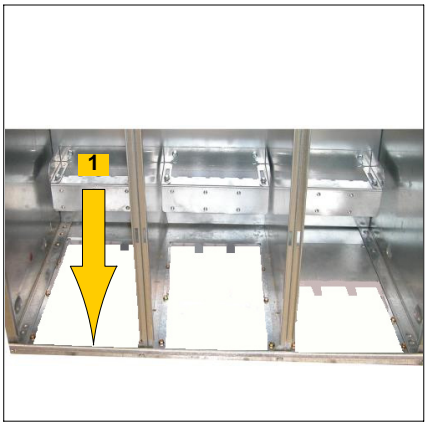
8.8 Fitting of cables with a blanking-off flooring (optional)



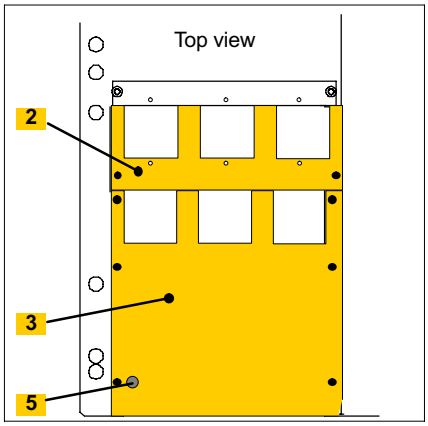
- Place the complete flooring on the ground, at the switchboard's definitive location (represented here by 2 cables per phase for the C Functional Units).



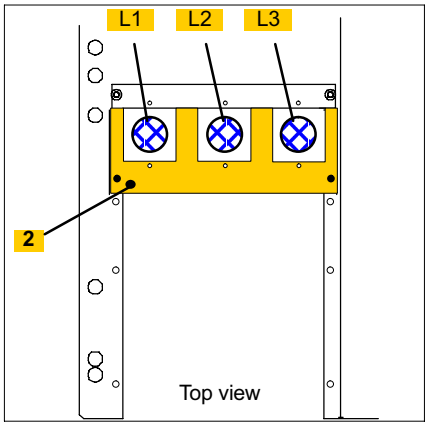
- Position the FBX switchboard on the flooring.
- Fix the switchboard (and the flooring) on to the ground (See § 6.2).



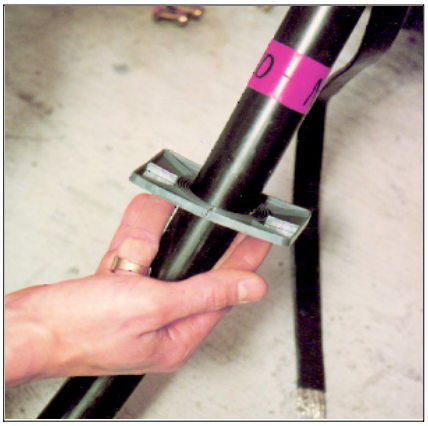
- Remove the lower (**1**) front cross member (4 x H M8 bolts).
- Recover any components required for the fitting of the panel which are included in the package.



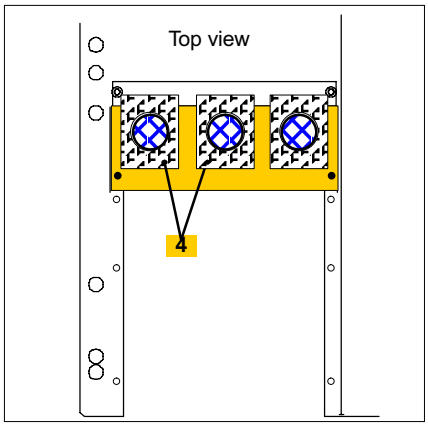
- Example: Position of the sheets for a 2-cable per phase assembly in Functional Unit C - Left hand end (with Cap **5**).



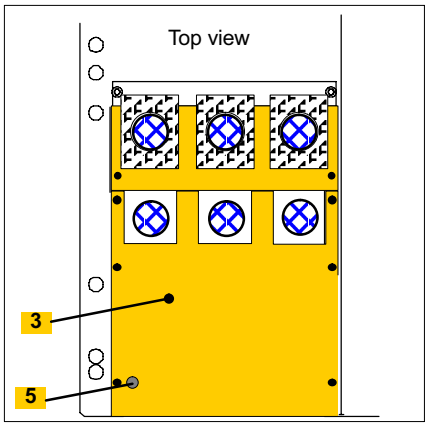
- Pass the 3 cables of the first Functional Unit to be connected.
- Position and fix the plate (**2**) in accordance with the marks on the cables (2 x H M6 bolts).



- Cut the cables to the required length.
- Cut and fit each grommet (**4**) on to its cable.



- Fit the plug-in connectors.
- Connect and strap the cables.
- Clip the blanking pieces (**4**) into their housings.



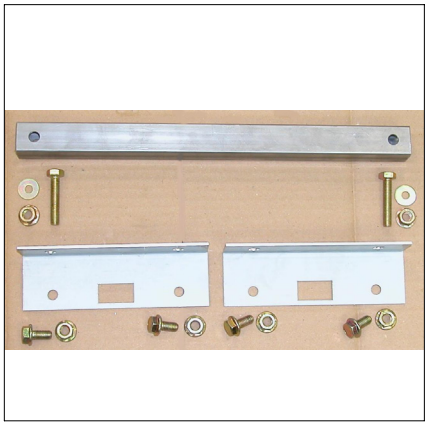
- Pass the following 3 cables.
- Position and fix the front plate (**3**) in accordance with the marks on the cables (6 x H M6 bolts).

- Proceed in an identical way for the connection of the first 3 cables.
- Fit the cross member (**1**) in place.

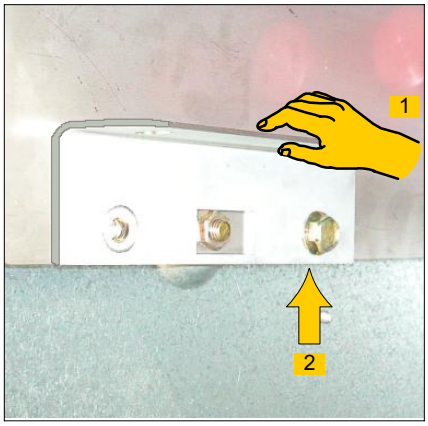
NOTICE

The hole (**5**) is used to pass the general earthing cable for the switchboard through to the room's ground electrode:
- Remove the cut-out,
- Fit the cable gland supplied in the accessories kit,
- Pass the earthing cable through the gland,
- Connect the cable to the earthing terminal (See chapter 7).

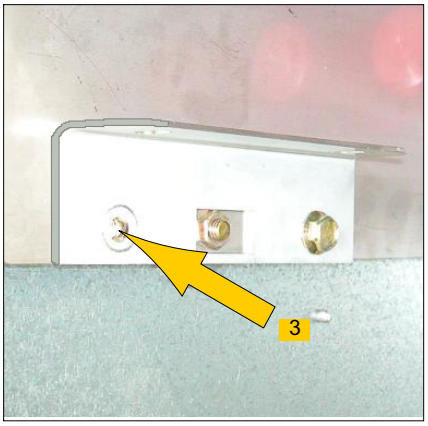
8.9 Assembly of 3 cables per phase (optional)



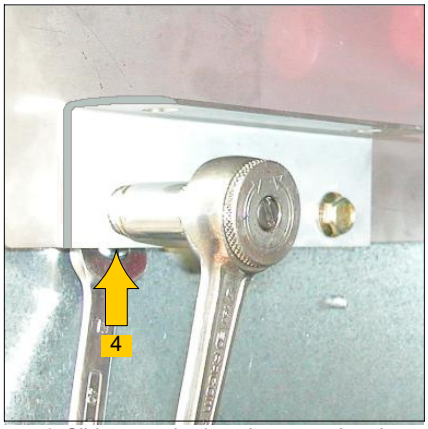
- Parts kit for the plug-in connectors mounting.



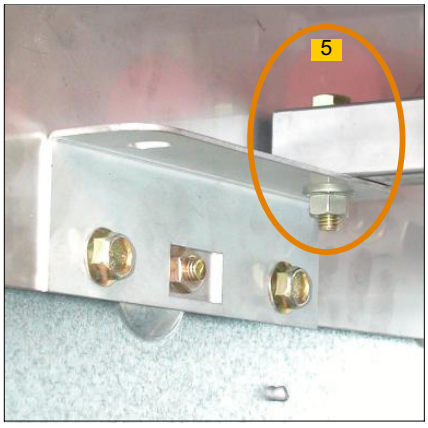
- 1. Position an angle bracket, horizontally, on the left-hand side.
- 2. Slide a notched nut between the plate and the wall.
- Screw in and tighten the first threaded bolt.



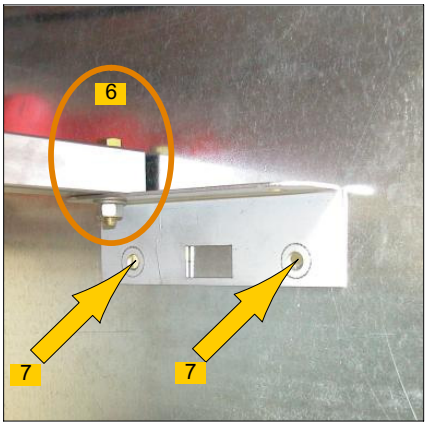
- Position the angle bracket horizontally.
- 3. Drill the plate through the second hole (drill bit Ø 8.5 mm).



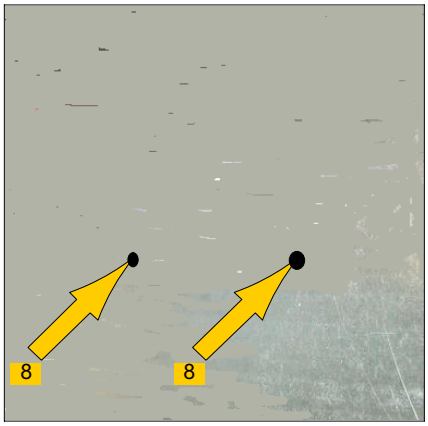
- 4. Slide a notched nut between the plate and the wall.
- Screw in and tighten the second threaded bolt.



- 5. Fix the bar on to this angle bracket (H M8x40 bolt).

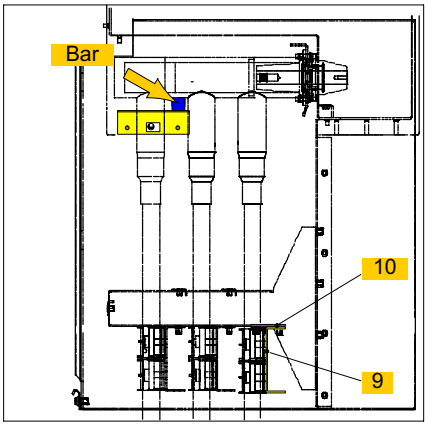


- 6. Fix the second angle bracket.
- Position this angle bracket in the same way as the one facing it.
- 7. Mark the 2 holes.



- Remove the angle bracket.
- Ensure that the adjacent compartment is accessible and not obstructed.
- 8. Drill the 2 holes (drill bit Ø 8.5 mm).

- Reposition the angle bracket.
- Engage the threaded bolts by the compartment on the adjacent Functional Unit.
- Screw on and tighten.
- Remove the bar.



- Position and fix the support (9) by the spacers (10).
- Note: this mounting support is inverted in relation to the two others.
- Connect the cables.
- Fit the bar after connecting the second cable per phase.

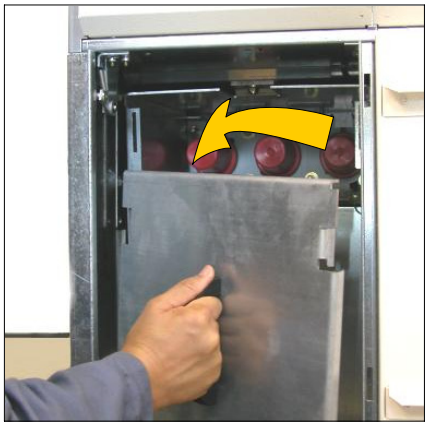
8.10 Access to the connections for the 25 kA cables (optional)

- To gain access to the cables connections, lift the door panel.

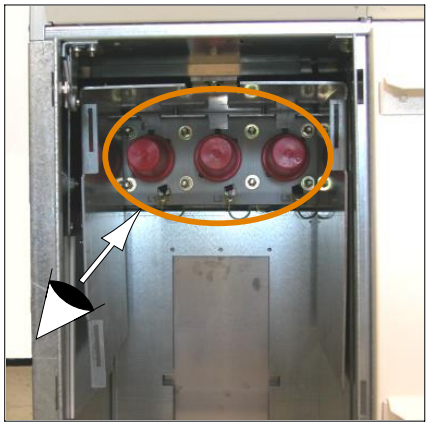
- Remove this door panel.

- A small panel equipped with a handle protects the plug-in bushings.

- Grip the handle.
- Slightly raise the gate then pull it towards you.



- Completely remove this gate.

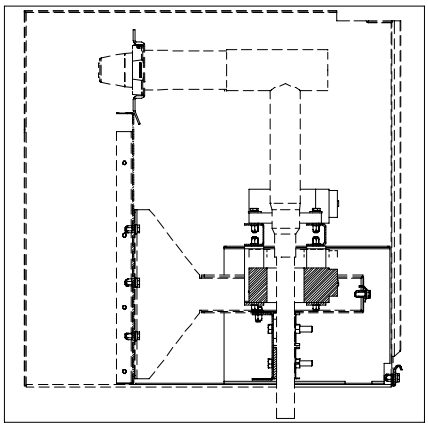


- The plug-in bushings are accessible.

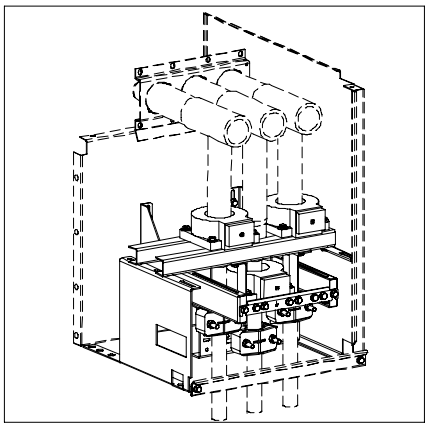
NOTICE

Do not forget to refit the gate back in place after connecting the cables.

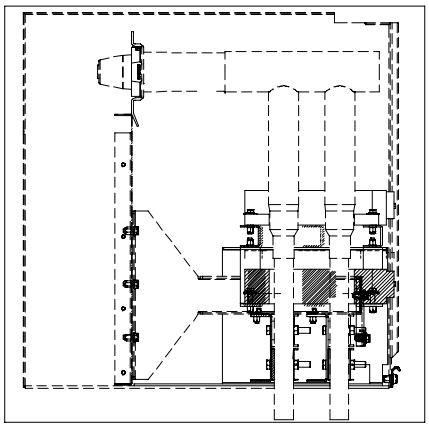
8.11 Fitting one or two cores per phase (option)



- The fitting of the cores must be carried out at the same time as the connections to the withdrawable plugs.
- Final tightening is completed once the plugs have been connected.



- Phase L2: the core is fitted under the other two.



- Fitting a core with 2 cables per phase.

9 Switchboard extensions for simple extension (SE) or double extension (DE)

9.1 Intervention levels

Levels	Description
1	Operations as noted as instructions in the ”Operation - Maintenance” notice, carried out by trained personal capable of intervening whilst respecting the rules of security.
2	Complex operations, requiring specific expertise and the use of support equipment in accordance with the constructor's procedures. These are carried out by the constructor himself or by a specialised technician who has received regular training by the constructor as part of the implementation of procedures and who is equipped with specific equipment.
3	All preventive and corrective maintenance, all renovation and reconstruction work is carried out by the constructor.

Extensions may be put together by personnel qualified in HVA equipment and HVA/LV substation interventions, equipped with this manual.

Apart from mechanical assembly skills, the electro-technical knowledge required for the connections is similar to the skills required for the connection of a separable HVA connector.

9.2 Intervention Instructions

Intervention	Busbar	Cables	Load-break switches	Earthing switches
Level 1	De-energized	De-energized	Open	Closed

Locking out the Functional Unit
Apply the general safety instructions for electrical locking-out operations and the special rules for the network concerned

Tools required:
- Scissors
- Open-ended spanner - sizes 13 & 17
- 2 x open-ended spanner - size 16
- Ratchet wrench and extension + 13 mm socket
- Torque wrench

Parts required:
- 1 x FU Extension
- 1 set of coupling fittings (See § 9.6)

9.3 FBX switchboard lockout

The switchboard must be de-energized, all load-break switches opened and earthed. All earthing switches must be closed.

NOTICE

During the intervention, the time during which the female bushings are not covered by their blanking plugs must be reduced to a minimum.

If, for whatever reason, the installation operation is interrupted for more than 24 hours, the blanking plugs must be re-fitted and the cover screwed into place.

9.4 Connecting a 1250 A busbar

For assembling a 1250A busbar, see the corresponding notice to § 2.2.

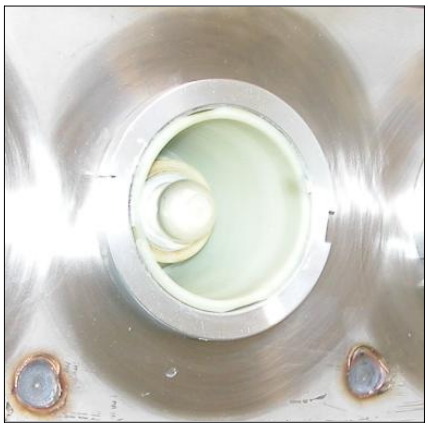
9.5 Reminder on the use of blanking plugs

⚠ CAUTION

One must be careful when using blanking plugs as there are two different types:

Insulated Plugs: When these are used the switchboard can be energized. A protective cover holds these plugs in place.

(Plastic) Protective Cover: Fitted to cross members to be connected on-site. This cover is only to be used to protect the bushing against dust.

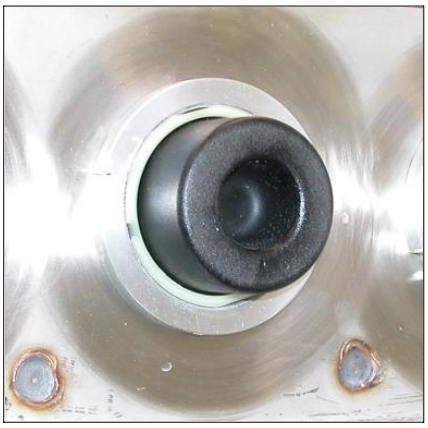


■ View of a bushing without protection – just prior to connection.

■ Plastic protective cover.

DANGER

This cover should never be fitted to an energized switchboard.



■ Insulated blanking plugs are compulsary for sealing off bushings on an energized switchboard.

NOTICE

The plug in the photograph is shown without the cover plate used to compress it in place.

9.6 Coupling accessories

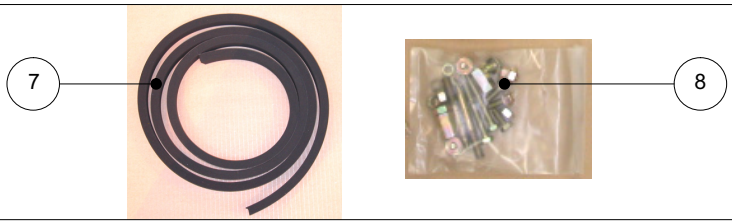
A box, containing:

Legend

- *1 Assembly Manual for extensibility kit*
- *2 Cleaning wipe*
- *3 Glove*
- *4 Tube of grease*
- *5 3 Extension connectors*
- *6 3 Adapters (optional)*

Additional supplies

- *7 Foam strip seal*
- *8 1 bag of fasteners, including:*
  - *2 spacers,*
  - *2 guide pins + 4 M10 nuts,*
  - *2 x H M8x60 bolts plus washers and nuts,*
  - *1 x H M8x20 bolt plus washers and nut.*



9.7 Equipment for the Functional Unit extension (See § 9.6)

NOTICE

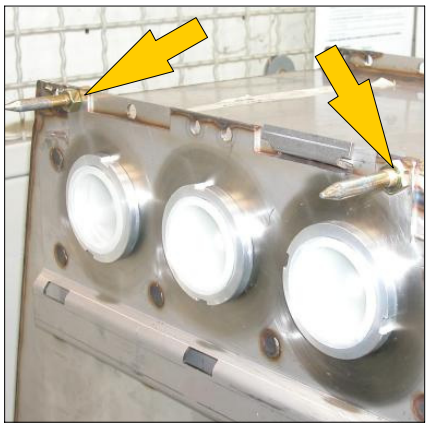
The earth is on the extendable switchboard. There is no independent earth on the extension unit.

NOTICE

Position the extension unit a short distance (several dozen centimetres), mounting it on steel shims.

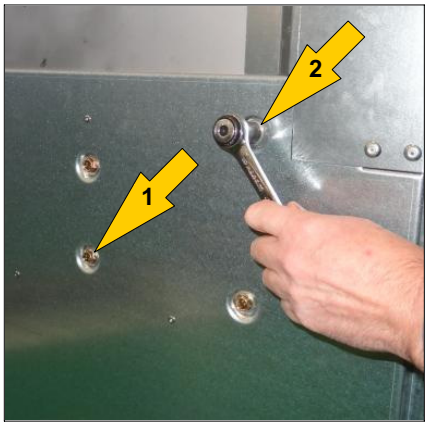
- Attach a guide pin (8) to the front of the unit using two M10 nuts.

- Fix an identical guide pin (8) to the rear of the unit.



- Tighten using two 16 mm spanners.

- Remove the cable compartment cover (See § 6.1).



- Remove screw **1** and store carefully.
- Loosen screw **2** by a few turns.

- Tap the head of screw **2** with a hammer to remove the internal nut insert.

9.8 Extendable switchboard equipment (See § 9.6)

- Remove the cable compartment cover (See § 6.1).

- Remove screw **1** from the side panel and use it to fix a spacer (8) in its place, passing the screw through from the inside of the compartment.
- Tighten, without locking.

- Loosen screw **2** a few turns then tap the screw head with a hammer to remove the internal nut insert.
- Remove the screw **2** completely and store carefully.

- Attach the second spacer (8) using the screw **2**.
- Tighten, without locking.

- Attach the self-adhesive strip (7) vertically along the edge.

- At the bottom, cut off any excess material.

Preparation the existing extensible unit (Version after 03/2008)

- Loosen, alternately, the two fixing bolts of the insulated end cap compression plate.

⚠ CAUTION

Light pressure is applied by the insulated blanking plugs to this plate.

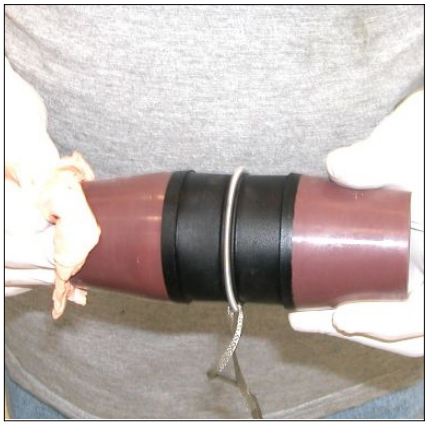
- Remove the plate.

- Wear gloves to remove the plugs.
- Apply an alternative side to side force on each plug, so that air can progressively enter into the plug-crossmember interface whilst pulling towards the rear.

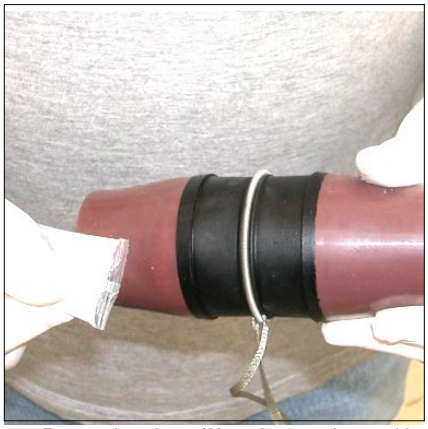
- Clean the inside of the three bushings with a cleaning cloth (2).

- Put on the glove (3) to cover the insides of the bushings with a thin coating of grease (4).

Preparation of the insulated extension connectors (5)



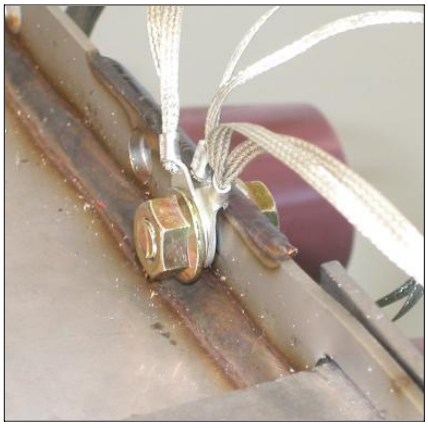
- Clean each extension connector (5) with the cleaning cloth (2).



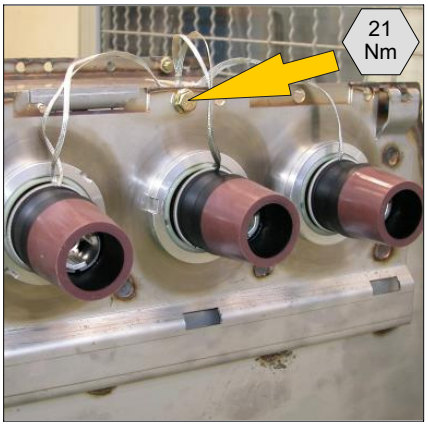
- Put on the glove (3) and cover them with a thin coating of grease (4).

Installation of the insulated extension connectors (5)

- Firmly push each extension connector onto its contact assembly.



- Link together the three earthing braids.
- Position the cable ends as shown above.

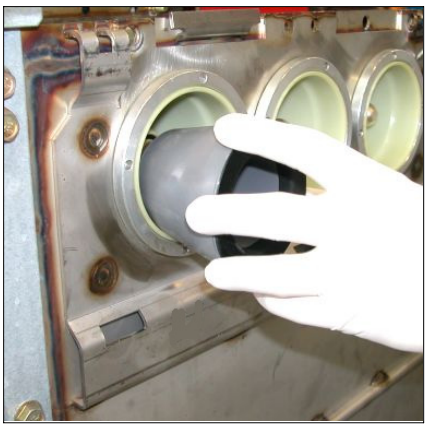


- Fix and tighten the braids using 1 x H M8x20 screw + flat washer + locking washer + nut.

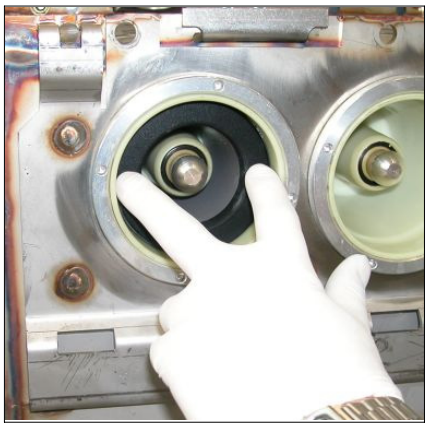
Preparation the existing extensible unit (Version before 04/2008)

- Clean the internal and external surfaces of the adapter (6).
- First apply a light coating of grease to the internal surface.

- Then apply a light coating of grease to the external surface.

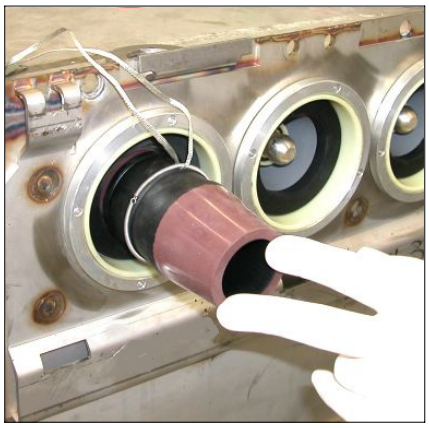


- Place an adapter into each of the bushings.

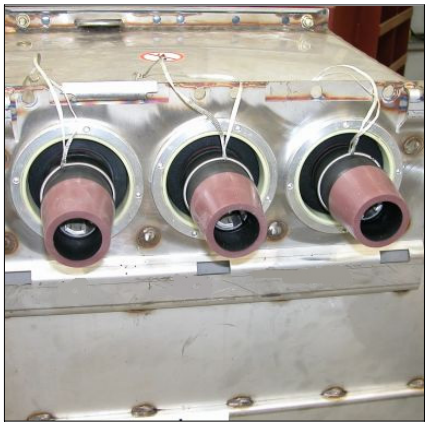


■ Assure each adapter is pushed to the base of the bushing.

■ The three adapters in position.

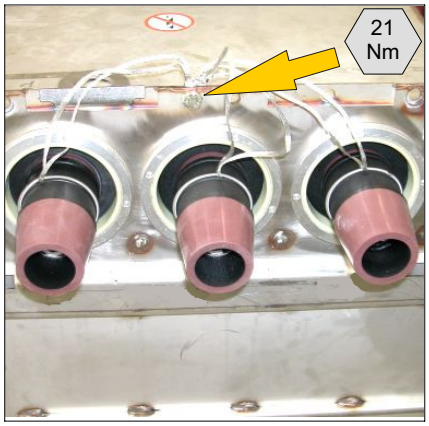


■ Firmly push each extension connector onto its bushing contact.



■ The three extension connectors in position.

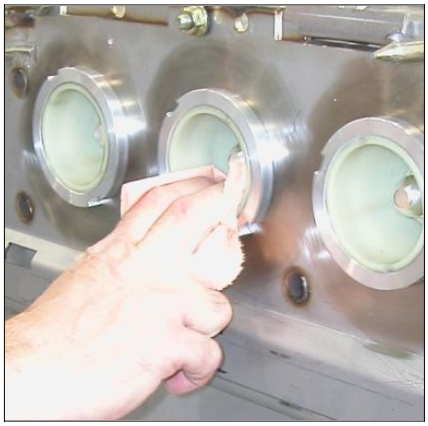
■ Link together the three earthing braids.
■ Position the cable ends as shown above.



■ Fix and tighten the braids using 1 x H M8x20 screw + flat washer + locking washer + nut.

Preparation of the extension unit

■ Remove the three white plastic covers.

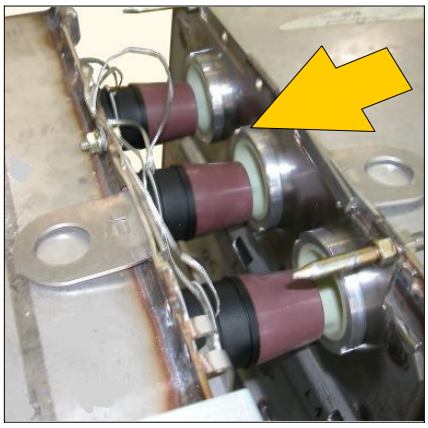


■ Clean inside the three bushings with a cleaning cloth (2).

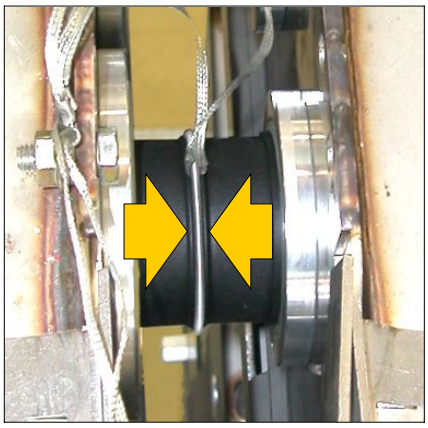
■ Put on the glove (3) and apply a thin coating of grease (4) to the insides of the bushings.

9.9 Switchboard assembly

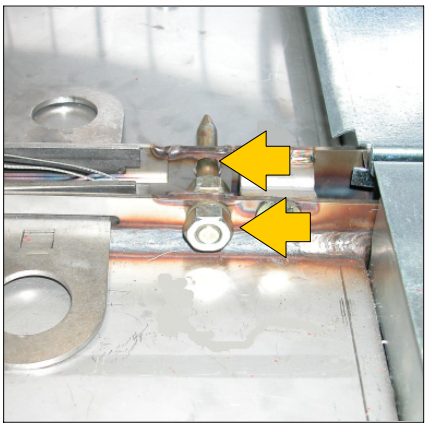
The pins (8) are used to guide the insulated tubes and ensure the holes are lined up to bolt together the upper section of the switchboard.



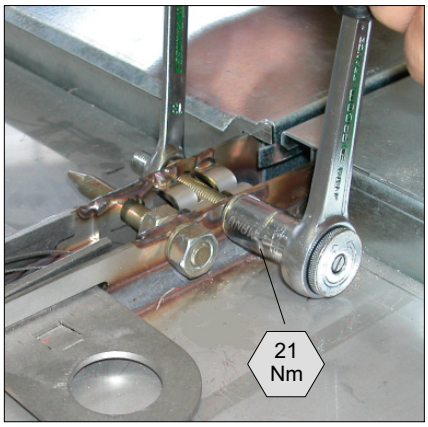
- Gently push the extension unit towards the existing extendable switchboard unit.



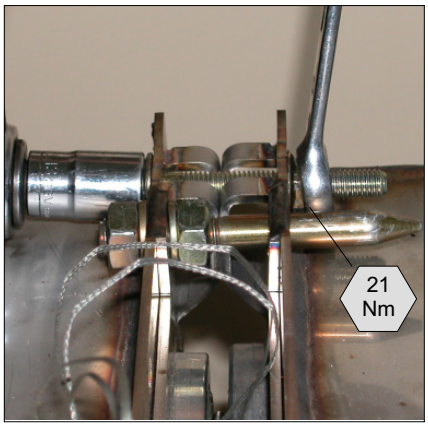
- Ensure that the earthing connection is correctly centred in the middle of the extension connector.



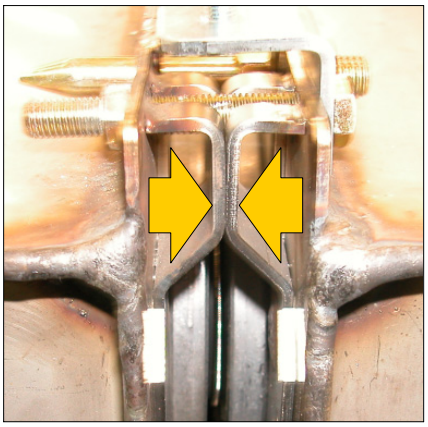
- Align the pins to the holes.
- Push the extension unit towards the existing extendable switchboard unit.



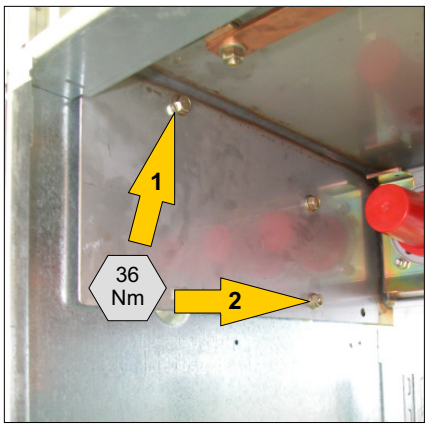
- At the front, fit the first bold (H M8x60 + locking washer + nut).
- Tighten a few turns.



- At the rear, fit the first bold (H M8x60 + locking washer + nut).
- Tighten a few turns.



- Continue to alternate between tightening the front and rear nuts until the two reference faces touch each other.



- Screw into each spacer using 1 x H M8x12 screw through the inside of the cable compartment on the extendable switchboard.

⚠ CAUTION

Once assembly has been completed, wait 15 minutes before energizing the installation.

Fixing to the floor and connecting

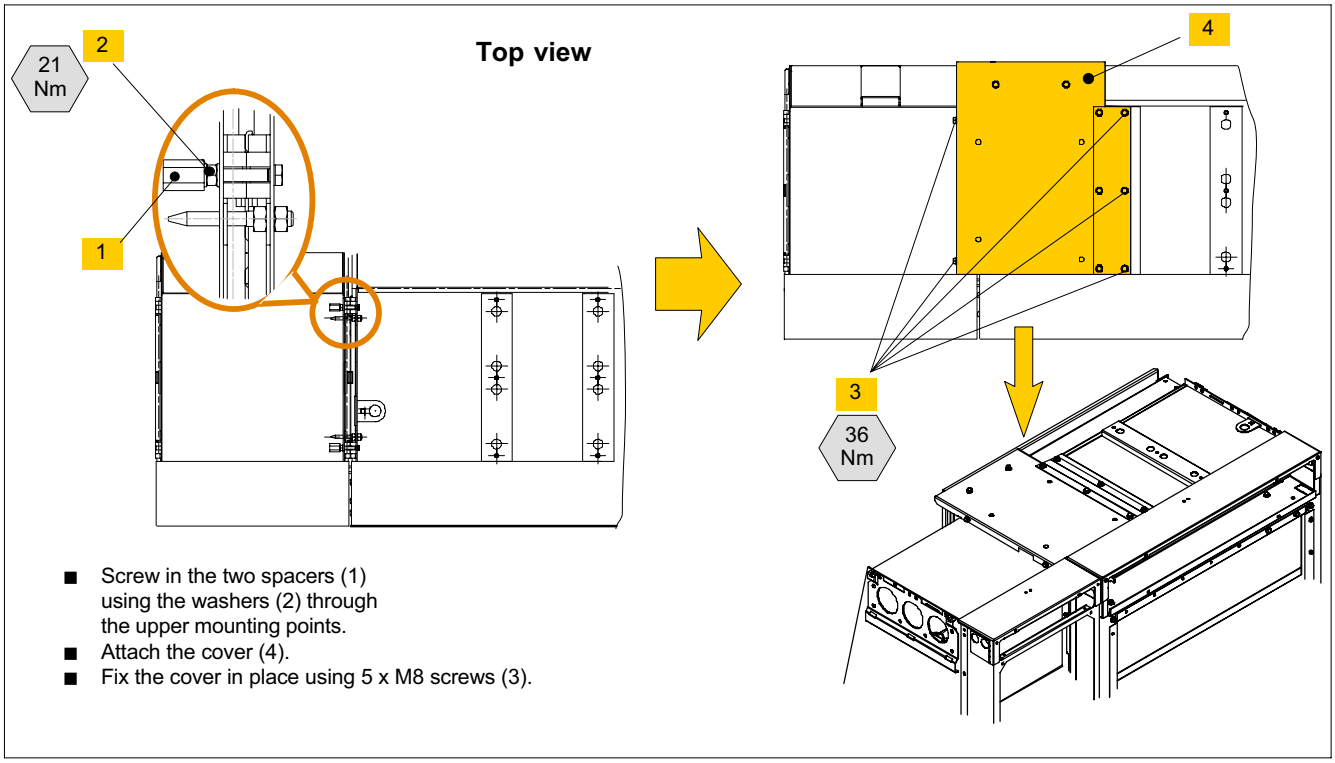
The extension unit must be attached to the floor in accordance with the instructions given in chapter 6.

Pay careful attention to avoid stressing the extension unit when fixing to the floor (chock in place if necessary).

Proceed with the connection of the cables as described in chapter 8.

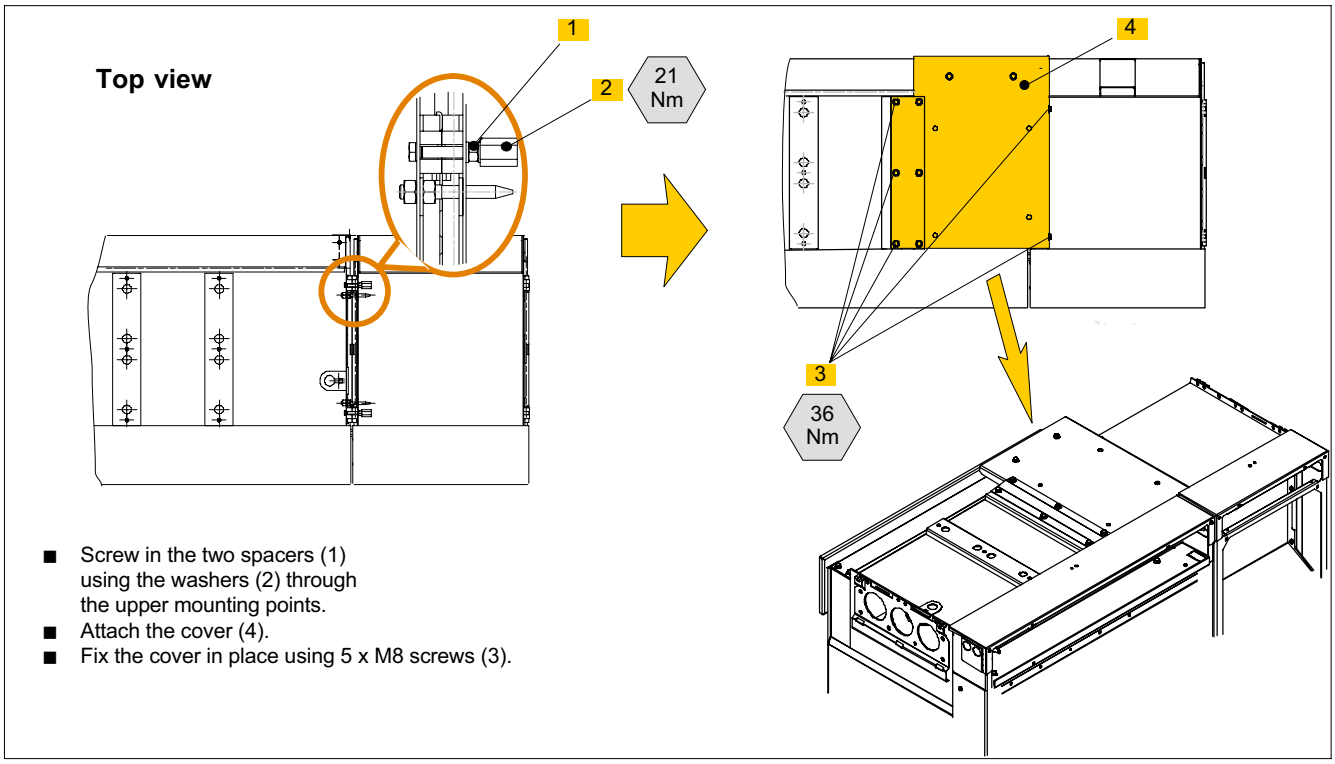
10 Fitting a protective cover (Function M Only)

10.1 For a LHS coupling



- Screw in the two spacers (1) using the washers (2) through the upper mounting points.
- Attach the cover (4).
- Fix the cover in place using 5 x M8 screws (3).

10.2 RHS coupling



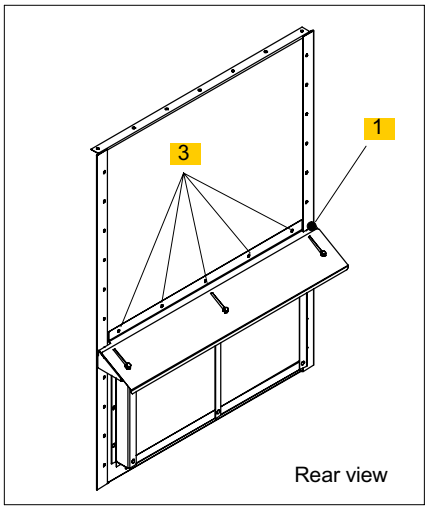
- Screw in the two spacers (1) using the washers (2) through the upper mounting points.
- Attach the cover (4).
- Fix the cover in place using 5 x M8 screws (3).

11 Fitting a rear deflector to a Function M

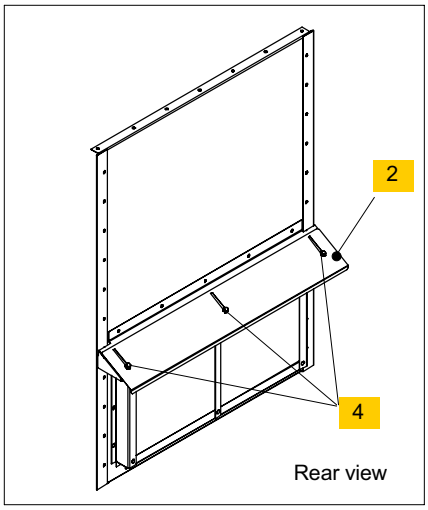
11.1 When required

The internal arc deflector is compulsary when the unit is installed within a room with a ceiling height of ≥ 2 m and < 2.4 m.

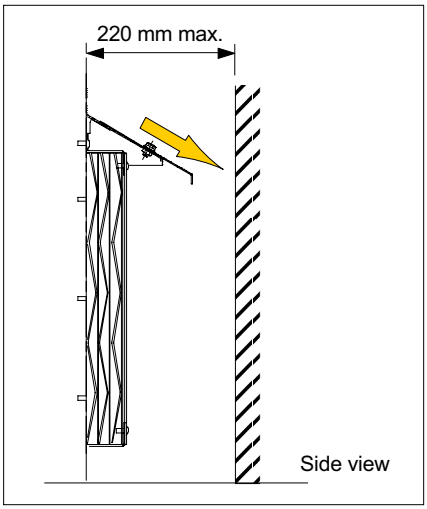
11.2 Fitting the deflector to the rear of the Function M



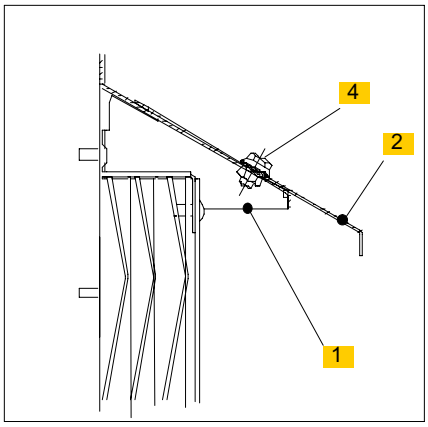
- Attach the rear deflector mounting (1) to the five M8 nuts (3) on the rear of the unit.
- Position the FBX in its definitive location.
  NB: The distance, with respect to the rear partition, must not exceed 220 mm.



- Loosen the 3 fixing screws (4) for the removable blanking plate (2).



- Lower the removable plate until it touches the partition.
- Tighten the 3 fixing screws (4).



- Details of the assembly.

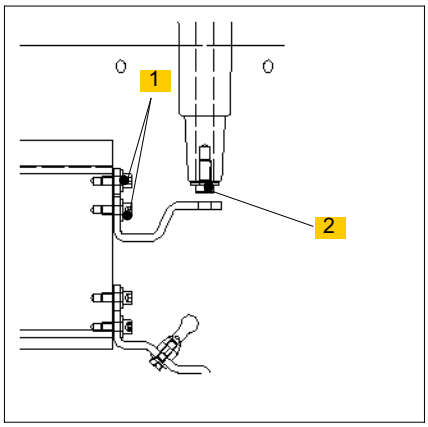
12 Connecting transformers within Measurement Functional Units

12.1 General

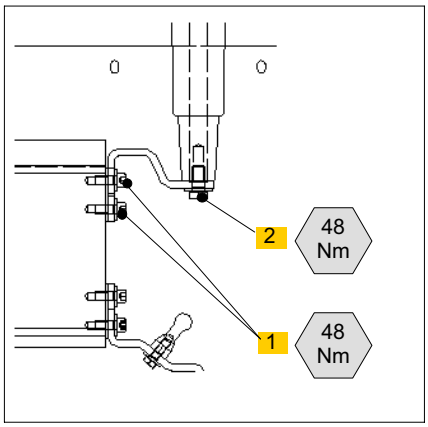
To avoid any damage, the transformers and cross members are not connected in the factory. Final assembly should be carried out on-site.

Within the cable compartment, the order of the phases, from left to right, is:
- M2: L1, L2, L3
- M3: L3, L2, L1

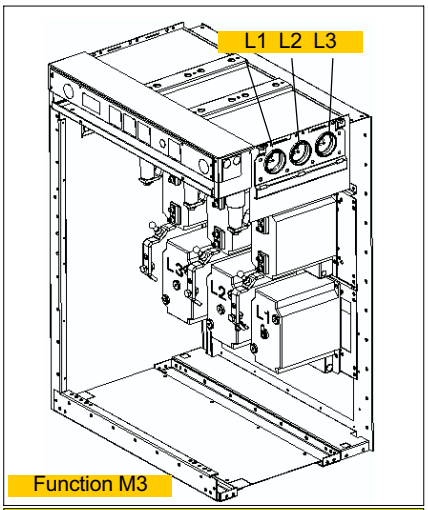
12.2 Connecting transformers in a type M2 or M3 functional unit



- State on Delivery: The upper connection is not established.
- Unscrew the two screws (1).
- Unscrew the upper mounting screw (3) on the cross member.
- Pivot the connection through 180°.



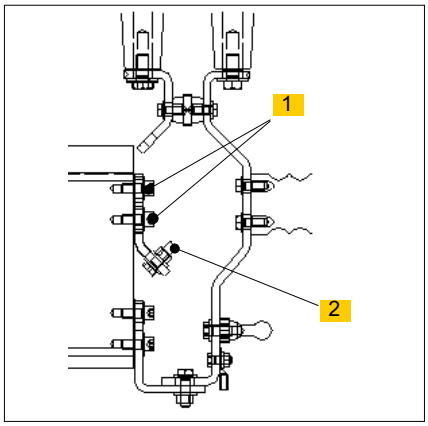
- Fix the connection to the transformer using 2 x M12 screws (1).
- Fix the end of the connection to the cross member using an M16 screw (2).



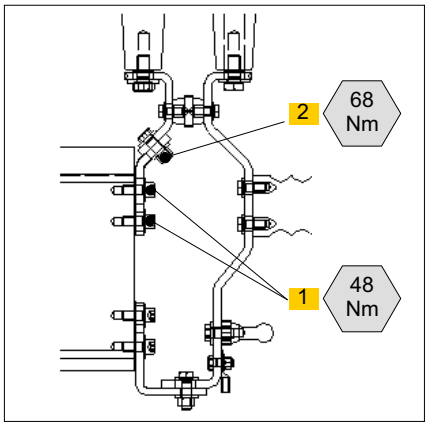
CAUTION

The order of the phases is inverted from those in the M2 functional unit.

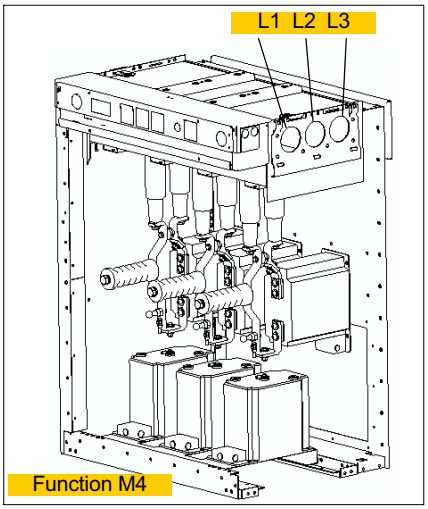
12.3 Connecting transformers in a Type M4 fonctional unit



- State on Delivery: The upper connection is not established.
- Unscrew the two screws (1).
- Unscrew the bolt (3).
- Pivot the connection vertically through 180°.



- Fix the bottom of the connection to the transformer using 2 x M12 screws (1).
- Fix the other end of the upper connection using an M12 bolt (2).



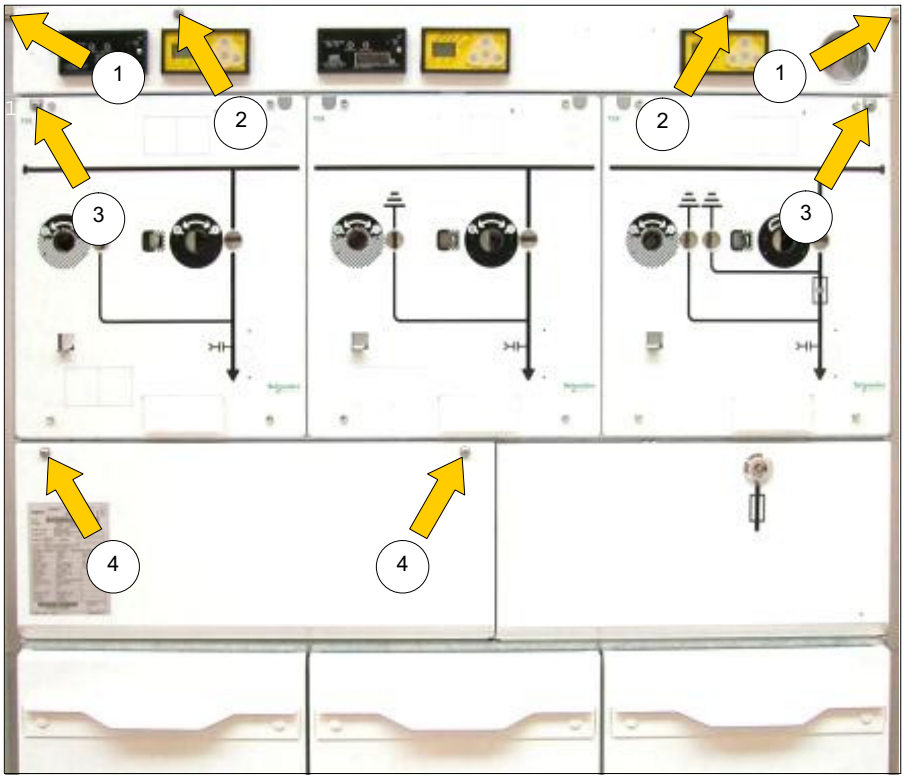
- Sectional view of the M4 functional unit.

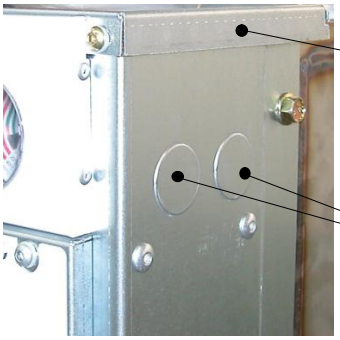
13 Low Voltage Connections

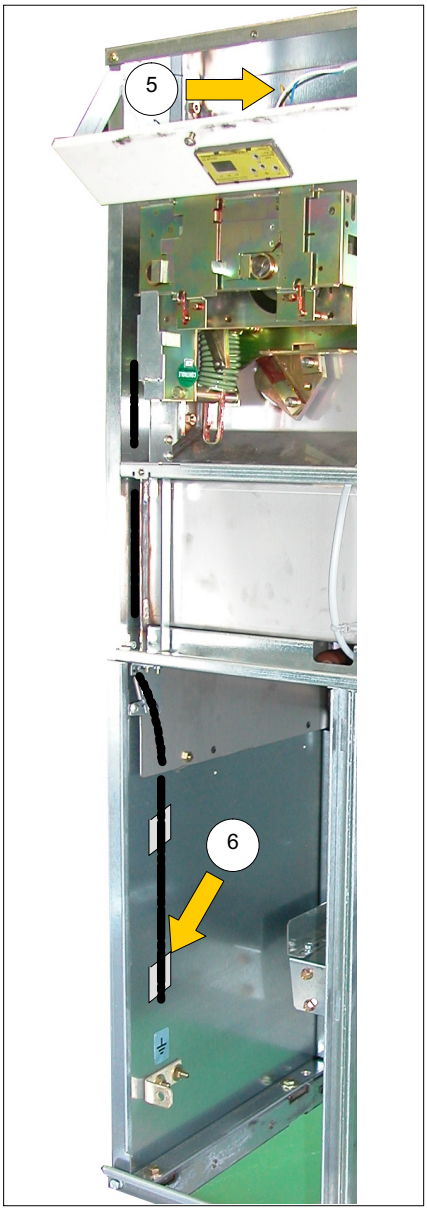
13.1 Intervention conditions (See § 9.1)

Intervention	Busbars	Cables	Load break switch	Earthing switches
Level 1	de-energized	de-energized	open	closed

13.2 Connection of the low voltage wiring







Loosen the two holding screws (3) and remove the mimic diagram panel.

Unscrew the two screws (2) from the indicator light protection panel then lift off by pivoting.

Unscrew and remove the upper roof panel, attached using two screws (1).

Unscrew the blanking panel below the mimic diagram (loosen 2 screws) (4).

Remove the cable compartment cover.

Route the external control cables (6) through and connect them to the flat terminals (5) as shown in the wiring diagram provided with the order (see § 13.3).

NOTICE

The low voltage wiring connections can also be passed through the knock-out panels on the left or right hand side of the switchboard (See picture above).

NOTICE

To avoid damaging the wiring, the oblong holes must be fitted with cable glands or edge-protection.

Once the low voltage wiring has been connected, continue with the refitting of the other panels in reverse order of fitting.

13.3 Circuit diagrams

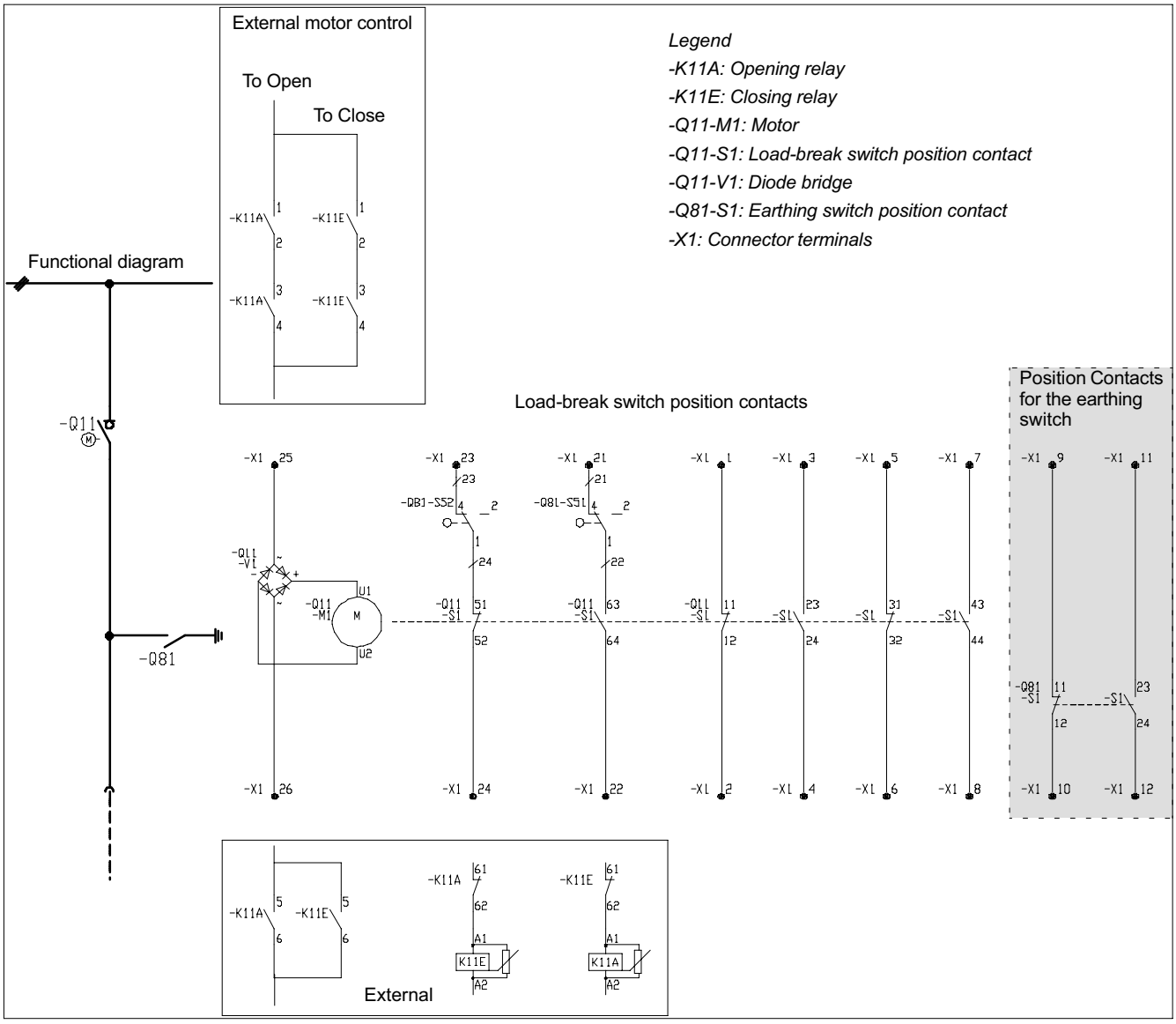
The following diagrams are given as examples only.

Please refer to the diagrams delivered with the equipment.

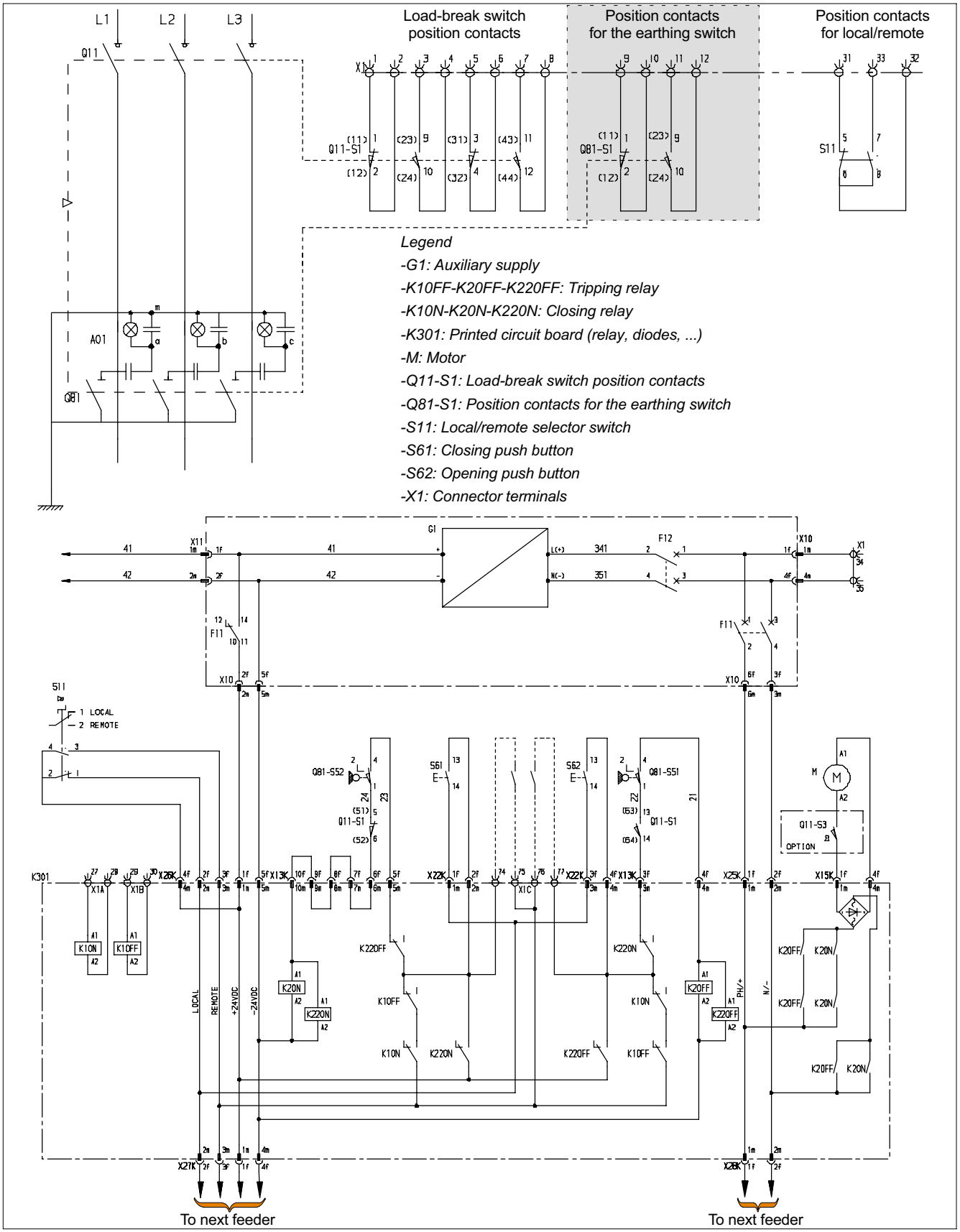
13.4 Shunt tripping coil

Function	Voltage	Inrush power
T1	24 / 48 / 60 / 110 / 125 / 220 VDC	160 W
	100 VAC	570 / 250 VA
	110 VAC	660 / 340 VA
	125 VAC	950 / 520 VA
	200 VAC	560 / 260 VA
	220 VAC	710 / 370 VA
T2	24 / 48 / 60 / 110 / 125 / 220 VDC	25 W

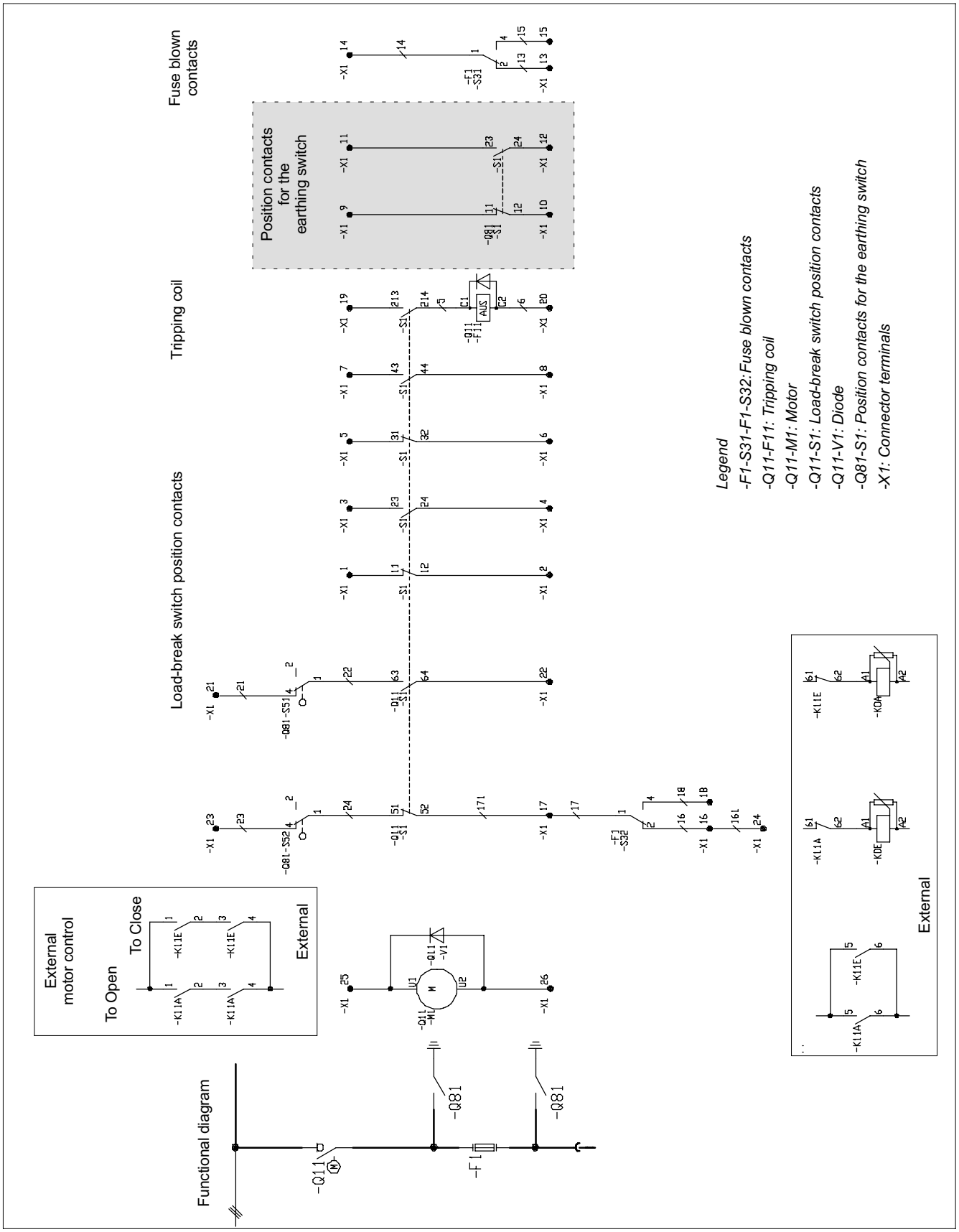
13.5 Standard diagram for motorized control (type AB2) for Function C



13.6 Standard diagram for motorized control (type AB3) for Function C

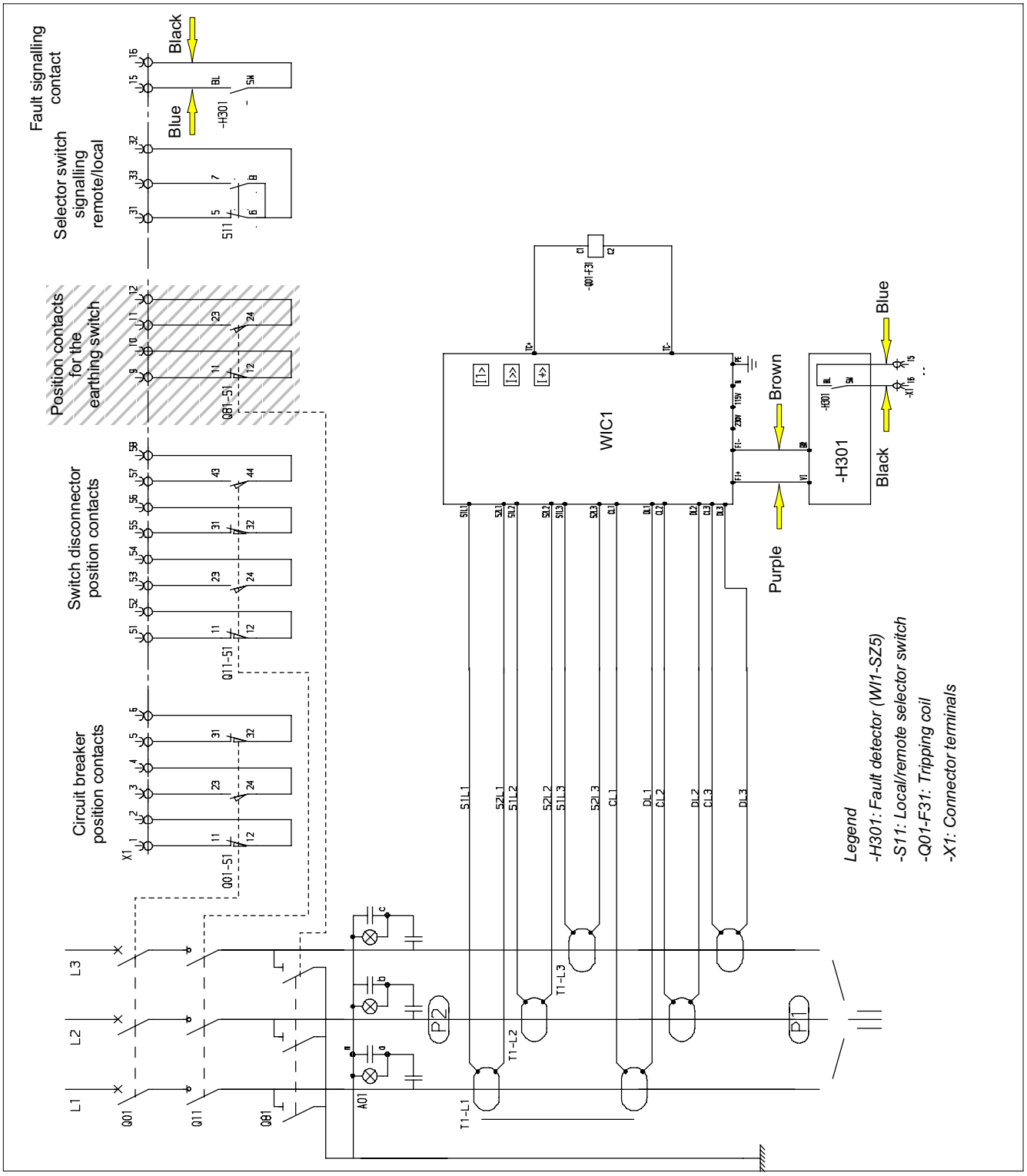


13.7 Standard diagram for motorized control (type AB2) for Function T1

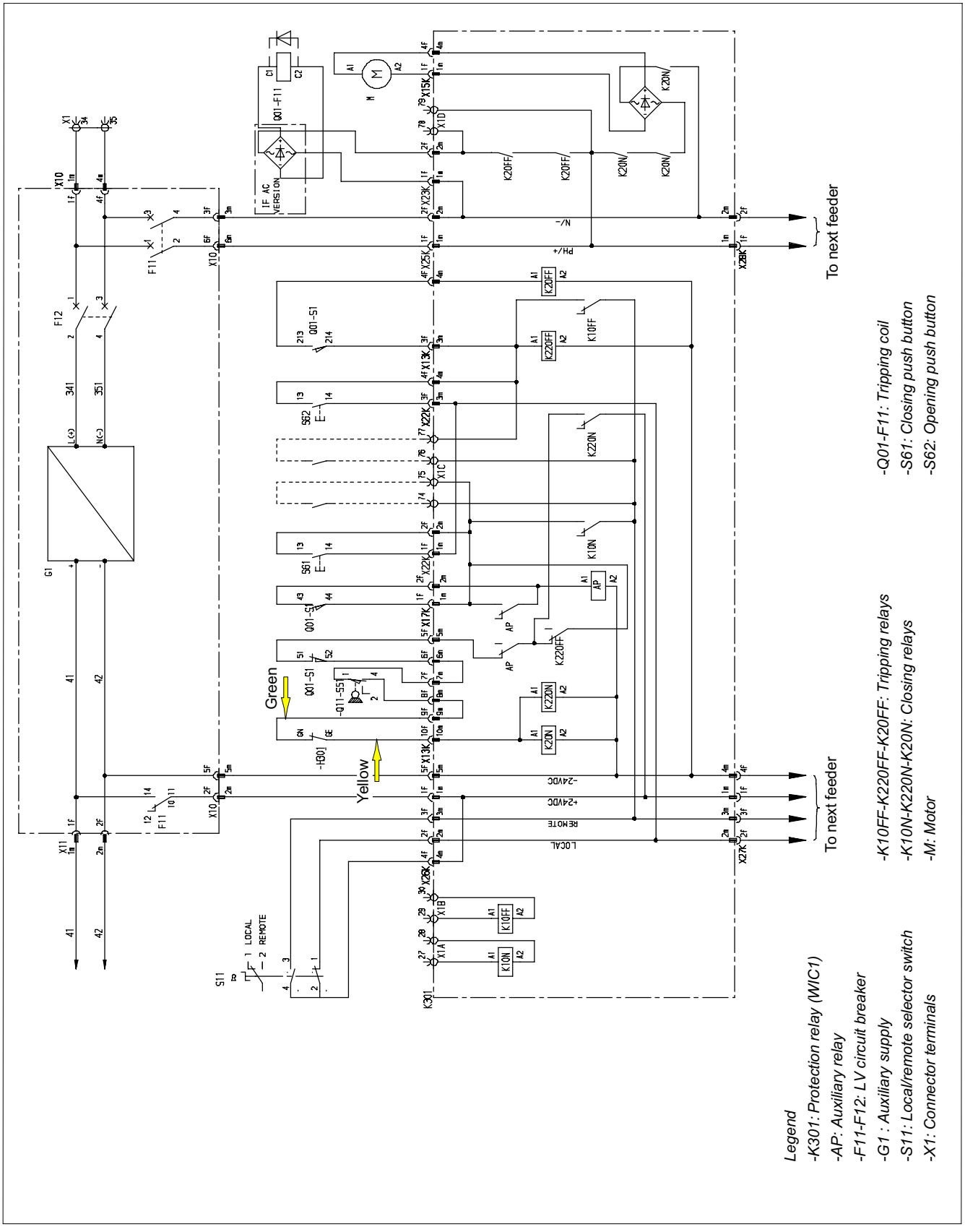


13.8 Standard diagram of a WIC1 protection (type AB3) for Function T2

“Measure - protection - signalling” part



“Control” part



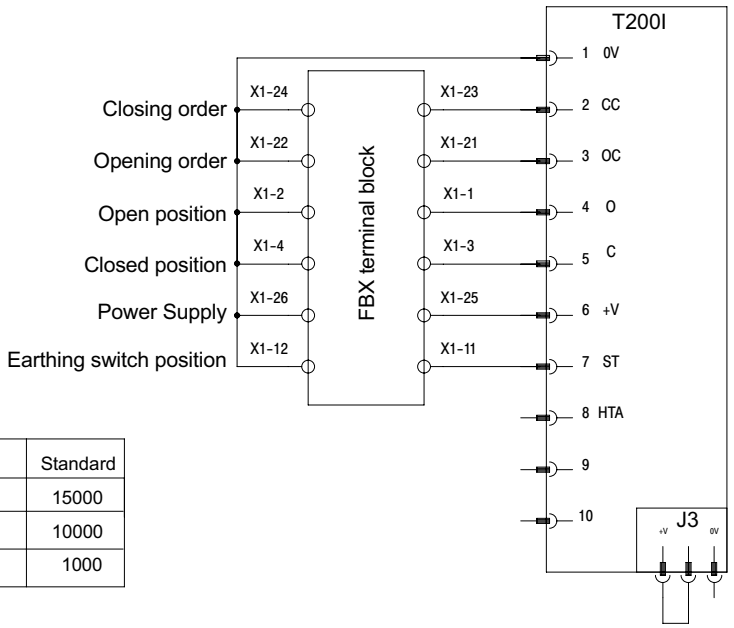
14 Connecting the FBX to the T200I control unit

14.1 Connecting a 630A CB Functional Unit

For CB schematics: 900225/000
AMT150829-01
AMT150830-01

CAUTION

The voltage of the T200 (48 VDC) and the auxiliary FBX voltage (motor and control system) have to be mandatory identical.
USE ONLY 48VDC!



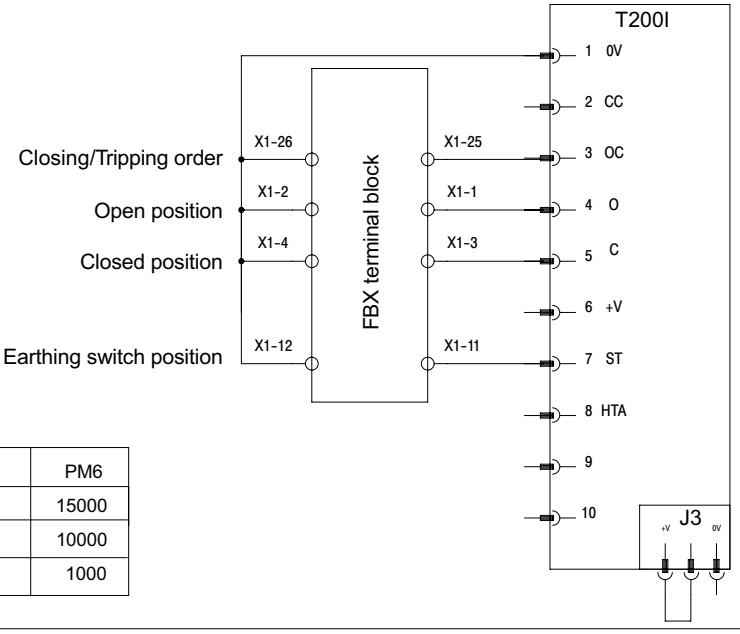
T200I settings	Type of control	Standard
	Timer - await return to position	15000
	Timer - non-complementary filtration	10000
	Timer - Operation time (excl. PM6)	1000

14.2 Connecting a C (AB2) Functional Unit

For C schematics: 900144/000
AGSC05101-01
AGSC05102-01

CAUTION

The voltage of the T200 (24 or 48 VDC) and the auxiliary FBX voltage (motor and control system) have to be mandatory identical.



T200I settings	Type of control	PM6
	Timer - await return to position	15000
	Timer - non-complementary filtration	10000
	Timer - Operation time (excl. PM6)	1000

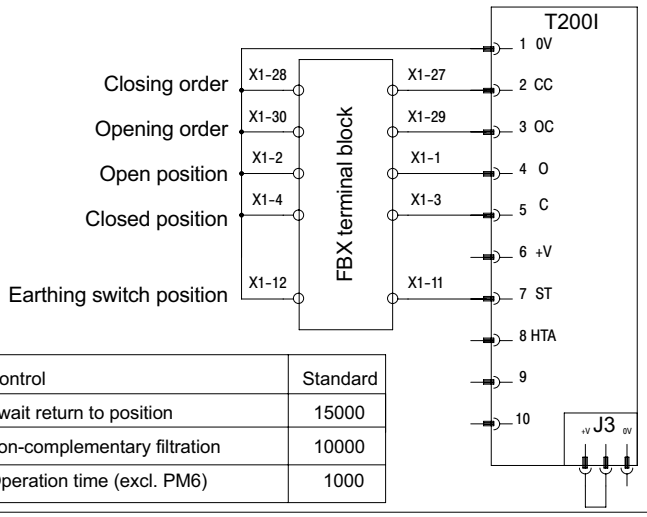
14.3 Connecting a C (AB3) Functional Unit

For C schematics: 900143/000

AMT150377-01
AMT150377-02

CAUTION

The voltage across the auxiliary relays (-K10N & -K10FF) and the voltage of T200 have to be mandatory identical.
Control circuit AMT150376-01
Auxiliary relays:
- 24VDC Ref. FINDER 40.52.9.024.0000
Ref. SEEF ST435-051-230
- 48VDC Ref. FINDER 40.52.9.048.0000
Ref. SEEF ST435-051-238



T200I settings

Type of control	Standard
Timer - await return to position	15000
Timer - non-complementary filtration	10000
Timer - Operation time (excl. PM6)	1000

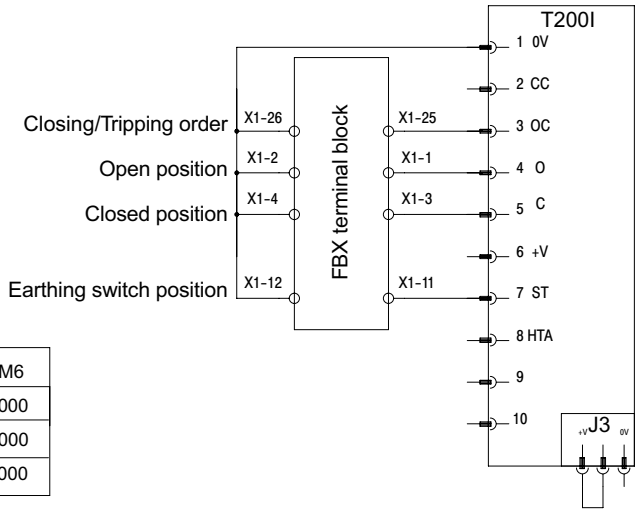
14.4 Connecting Functional Units C (AB2) and T1 (AB2)

For C schematics: 900144/000
For T1 schematics: 900154/000

AGSC05104-01
AGSC05105-01

CAUTION

The voltage of the T200 (24 or 48 VDC) and the auxiliary FBX voltage (motor and control system) have to be mandatory identical.



T200I settings

Type of control	PM6
Timer - await return to position	15000
Timer - non-complementary filtration	10000
Timer - Operation time (excl. PM6)	1000

14.5 Connecting Functional Units C (AB3) and T1 (AB3)

For C schematics: 900143/000

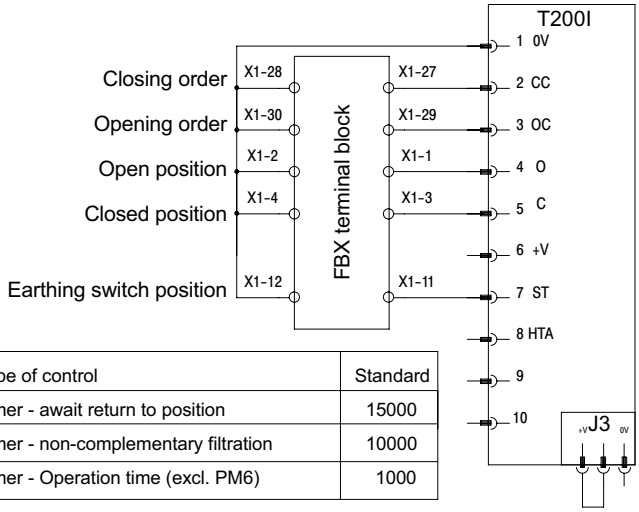
AMT150837-01
AMT150837-02

For T1 schematics: 900153/000

AMT150379-01
AMT150379-02

CAUTION

The voltage across the auxiliary relays (-K10N & -K10FF) and the voltage of T200 have to be mandatory identical.
Control circuit AMT150376-01
Auxiliary relays:
- 24VDC Ref. FINDER 40.52.9.024.0000
Ref. SEEF ST435-051-230
- 48VDC Ref. FINDER 40.52.9.048.0000
Ref. SEEF ST435-051-238



T200I settings

Type of control	Standard
Timer - await return to position	15000
Timer - non-complementary filtration	10000
Timer - Operation time (excl. PM6)	1000

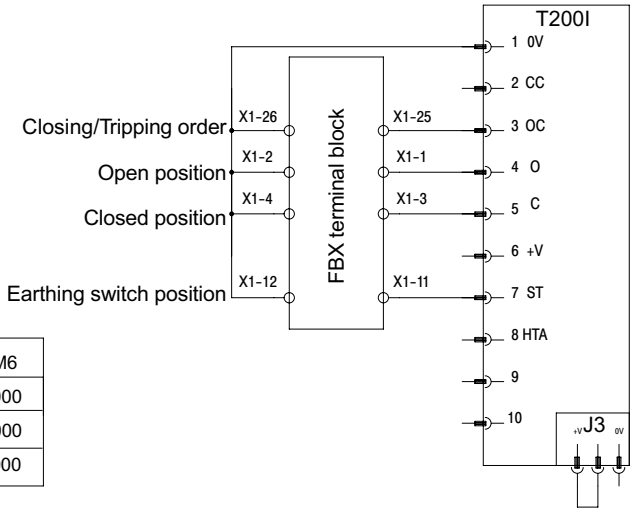
14.6 Connecting a T2 (AB2) Functional Unit

For T2 schematics: 900164/000

AMT150442-01
AMT150443-01

CAUTION

The voltage of the T200 (24 or 48 VDC) and the auxiliary FBX voltage (motor and control system) have to be mandatory identical.



T200I settings	Type of control	PM6
	Timer - await return to position	15000
	Timer - non-complementary filtration	10000
	Timer - Operation time (excl. PM6)	1000

14.7 Connecting a T2 (AB3) Functional Unit

For T2 schematics: 900163/000

AMT150381-01
AMT150381-02

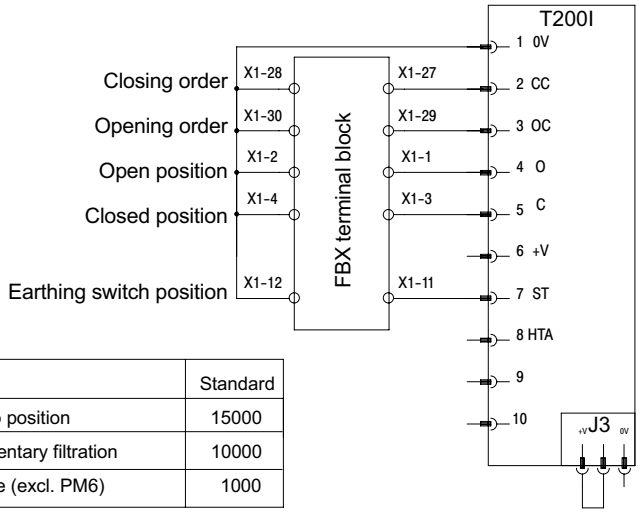
CAUTION

The voltage across the auxiliary relays (-K10N & -K10FF) and the voltage of T200 have to be mandatory identical.

Control circuit AMT150376-02

Auxiliary relays:

- 24VDC	Ref. FINDER	40.52.9.024.0000
	Ref. SEEF	ST435-051-230
- 48VDC	Ref. FINDER	40.52.9.048.0000
	Ref. SEEF	ST435-051-238

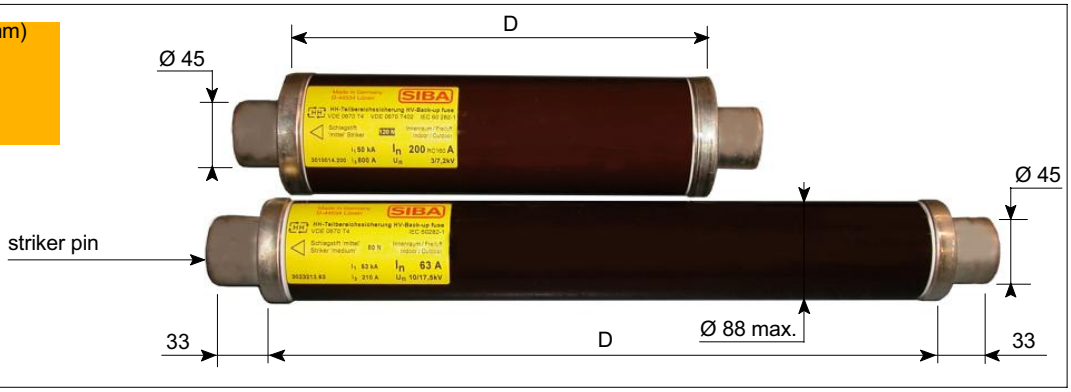


T200I settings	Type of control	Standard
	Timer - await return to position	15000
	Timer - non-complementary filtration	10000
	Timer - Operation time (excl. PM6)	1000

15.1 Dimensions (mm) of the fuses – in accordance with standards IEC60282-1 and IEC62271-105

Voltage	D (mm)
upto 12kV*	292
17,5 kV	442
24 kV	442

** Possible also in 442 mm*



15.2 Selection table for fuses

NOTICE

Use fuses with “average” type of striker with a maximum initial tripping force of 80 N.

Schneider Electric fuses (Flusarc-CF - CEI)

	Power of the transformer (kVA)																
	25	50	63	80	100	125	160	200	250	315	400	400	500	630	800	1000	1250
Un	Uk = 4%											Uk = 6%					
(kV)	**Rated fuse current (A)**																
3	10	25	25	31,5	40	50	50	80	100	100(2)	-	-	-	-	-	-	-
3,3	10	25	25	31,5	40	40	50	63	80	100(2)	-	-	-	-	-	-	-
5,5	6,3	16	16	20	25	31,5	31,5	40	50	63	80	80(1)	100(1)(2)	-	-	-	-
6	6,3	10	16	20	25	25	40	40	50	63	80	63	80(1)	100(1)(2)	-	-	-
6,6	6,3	10	16	16	25	25	31,5	40	50	63	63	63(1)	80(1)	80(2)	-	-	-
10	-	-	10	10	16	20	25	25	31,5	40	50	40	50	63(2)	80(1)(2)	-	-
11	-	-	10	10	16	20	25	25	31,5	40	50	40	50	63(2)	80(1)(2)	-	-
13,8	4	6,3	6,3	10	10	16	16	20	25	31,5	31,5	31,5	40	50(1)(2)	63(1)(2)	-	-
15	4	6,3	6,3	10	10	16	20	20	25	31,5	31,5	31,5	40(1)	50(1)(2)	63(1)(2)	-	-
20	-	-	6,3	6,3	10(1)	10	16	16	20	25	25	25	31,5(1)	40(1)	40(1)(2)	63(1)(2)	-
22	-	-	6,3	6,3	6,3	10	10	16	16	25	25	25(1)	31,5(1)	40(1)	40(2)	50(1)(2)	63(1)(2)

1) With optional mechanical delaying mechanism on the controls (70 ms)
2) Without transformer overload

Schneider Electric fuses (Flusarc-CF - DINVDE)

	Power of the transformer (kVA)																
	25	50	63	80	100	125	160	200	250	315	400	500	630	630	800	1000	1250
Un	Uk = 4%													Uk = 6%			
(kV)	**Rated fuse current (A)**																
6	6,3	10	16	20	25	25	40	40	50	63	80	100	100(2)	100(1)(2)	-	-	-
10	-	-	10	10	16	20	25	25	31,5	40	50	63	80	63(2)	80(1)(2)	-	-
15	4	6,3	6,3	10	10	16	20	20	25	31,5	31,5	50	63	50(1)(2)	63(1)(2)	-	-
20	-	-	6,3	6,3	10(1)	10	16	16	20	25	25	40	40	40(1)	40(1)(2)	63(1)(2)	-

1) With optional mechanical delaying mechanism on the controls (70 ms)
2) Without transformer overload

SIBA fuses (HH-DIN)

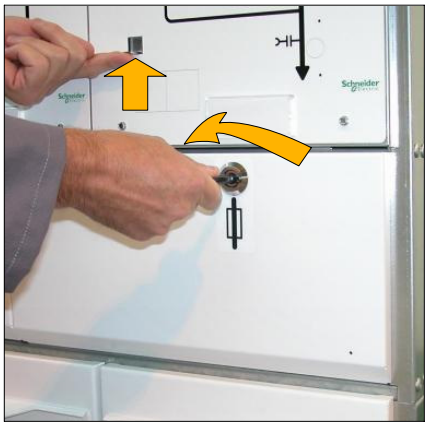
Un (kV)	Power of the transformer (kVA)															
	80	100	160	200	250	315	400	500	630	630	800	1000	1250	1500	1600	2000
	Uk = 4%									Uk = 6%						
	Rated fuse current (A)															
6	-	25	40	-	50	63	80	100	125	100	125	160(1)	-	-	-	-
10	-	16	25	-	32	40	50	63	80	63	80	100	100	-	160(1)	160
15	-	16	20	-	32	32	40	50	63(1)	50	63(1)	63(1)	80(1)	-	-	-
20	-	10	16	-	20	25	32	40	40	40	40	50	80(3)	-	100(1)(3)	125(1)(3)

1) With optional mechanical delaying mechanism on the controls
3) Specific type SSK fuses

15.3 Fitting a fuse [earthing switch closed]

Open the access cover to the standard fuse holders

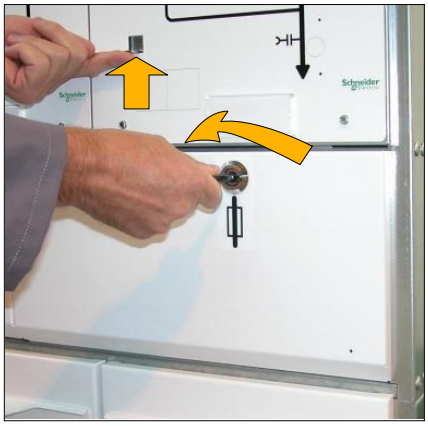
- Unlock the fuse compartment using the appropriate key.



- Lift the latch and open the panel.

- The end plugs of the fuse holders are now accessible.

Opening of the access cover to the leaktight fuse holders (by key or handle)



- Lift up the lock.
- Introduce the corresponding key and turn it to the left.

- Pull the cover towards the front until it stops.
- Turn the key in the reverse direction to unlock it.

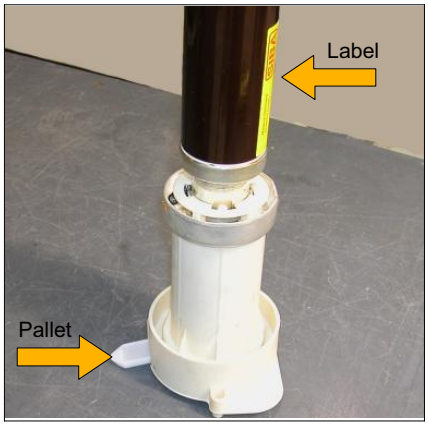
- Open the cover completely to gain access to the leaktight fuse holders' plugs.

Fitting the fuses in place

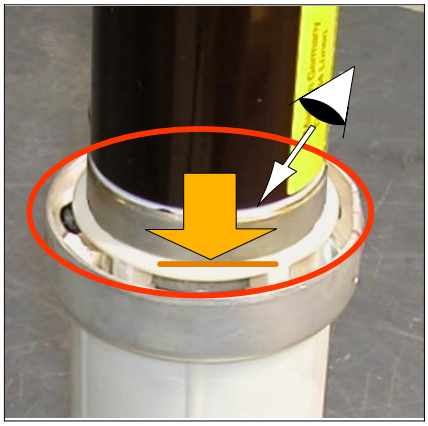
■ Pull the plug forwards without turning.

■ Remove the plug and place in a vertical position on a stable, clean surface.

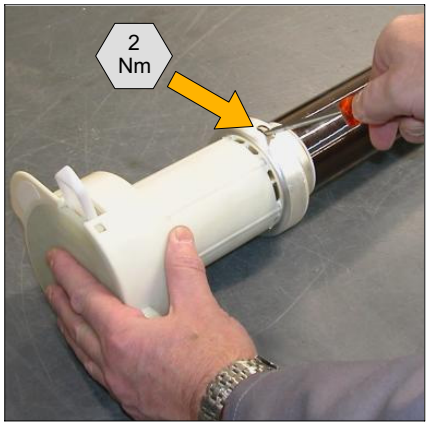
■ Loosen the clamp collar retaining screw.



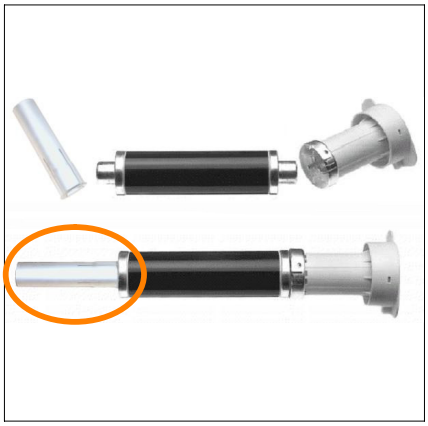
■ Fit the fuse:
- Label and emboss the plug side,
- Label opposite the fuse holder.



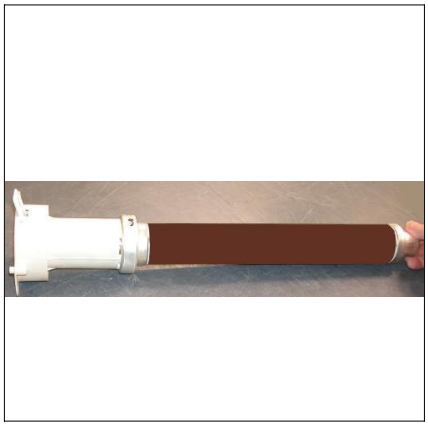
■ Insert the fuse into the clamps as far as possible, against the supporting ring.



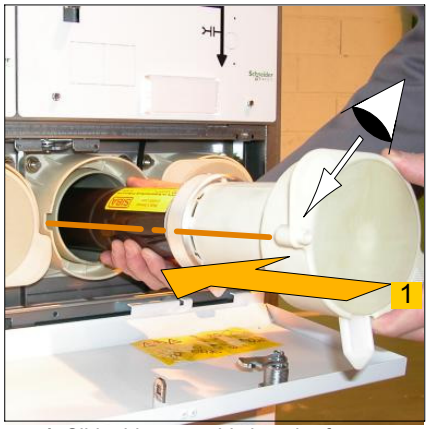
■ Place the assembly on a flat surface to make it easier to tighten the clamp collar screw to the required torque.



■ For fuses of up to 12 kV: Fit an adapter onto the other end of the fuse.



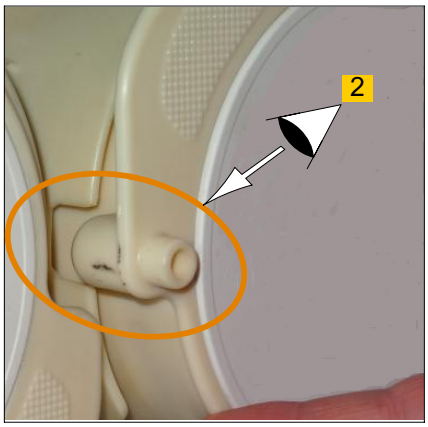
■ Make sure the fitted assembly (plug and fuse) is clean.



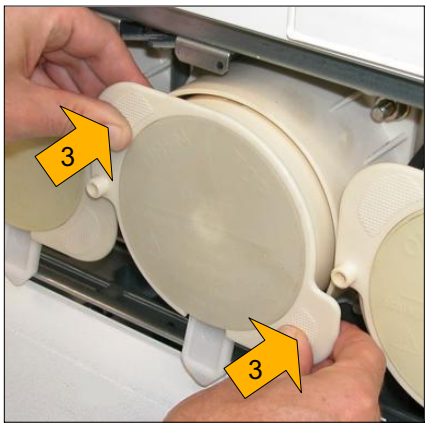
■ **1**. Slide this assembly into the fuse holders, aligning the lug on the plug with the slot in the holder.

⚠ CAUTION

Do not twist the assembly when inserting.



■ **2**. The lug on the plug must click into the slot in the fuse holder.



■ **3**. Push the plug, by the two tabs provided, up to the stop.
■ Now fit the other two fuses.

■ To re-close the fuse cover:
- Lift the latch,
- Lift the cover and push back into place,
- Lock the cover (using the key).

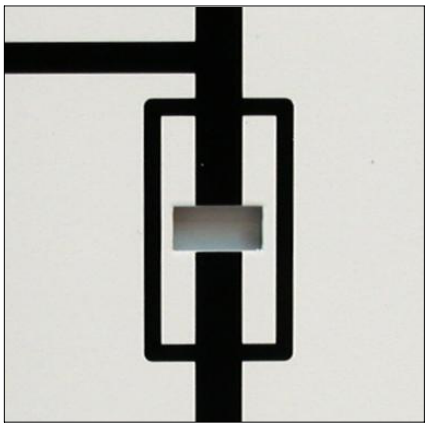
Processing fuse packaging

NOTICE

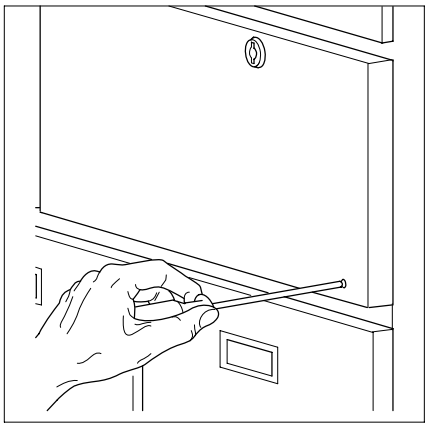
The packaging is to be disposed of via General Industrial Waste recycling channels.

15.4 Mechanical trip test on blown fuse

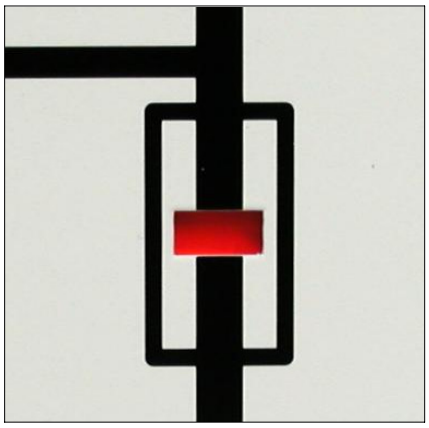
It is possible to test the mechanical trip mechanism activated by a blown fuse.



■ Check the tripping mechanism with the load-break switch `closed'.



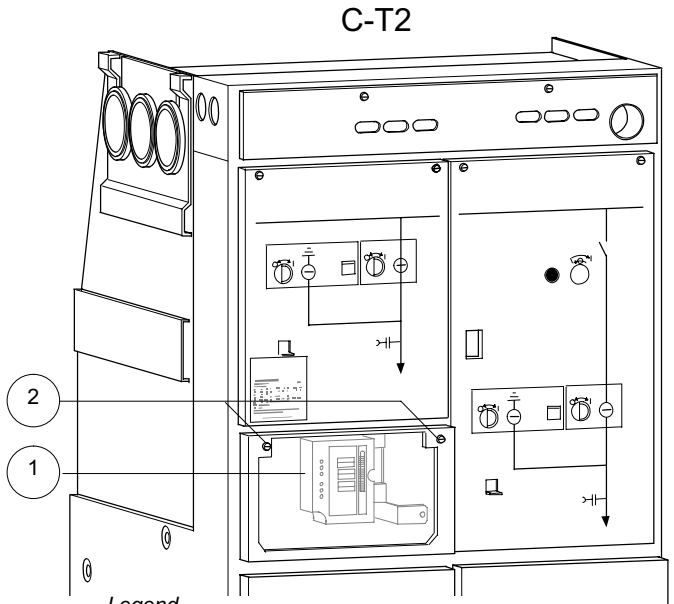
■ Insert a Ø 2.1 mm rod, W > 80 mm into the hole created for this purpose.

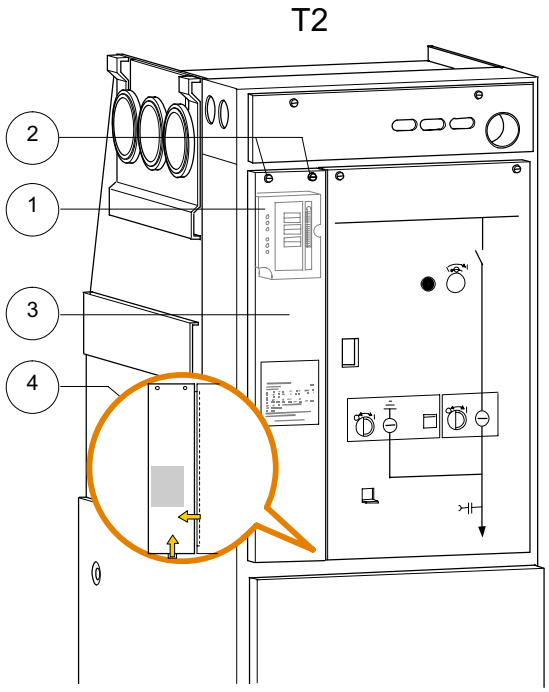


■ Push it until it stops.
■ Check that the fuse symbol is displayed red.

16 Protection Relays WIC1 or DPX-1

16.1 Location of the protection relays

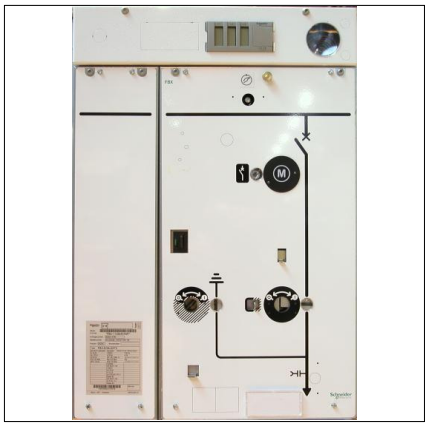




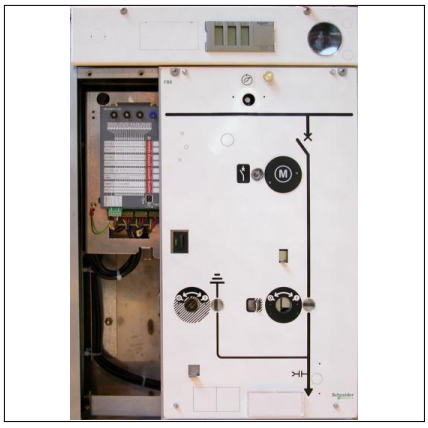
Legend

- *1 Relay WIC1 or DPX-1 (behind the panel)*
- *2 Panel fixing screws*
- *3 Front panel*

16.2 Access to the relays of a single T2 function (See markings in § 16.1)



■ Remove the 2 screws (2) which hold the front panel (3).



■ Lift the panel slighty and then slide to the left (4).

■ The relay (1) is now accessible.

16.3 Setting of the protection relays

NOTICE

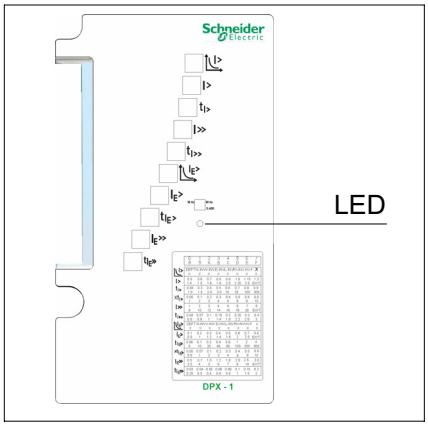
The relays are delivered set to their maximum values by default.

NOTICE

For the setting of the relays please refer to the instructions delivered with the equipment.

16.4 The protection relays WIC1 & DPX-1

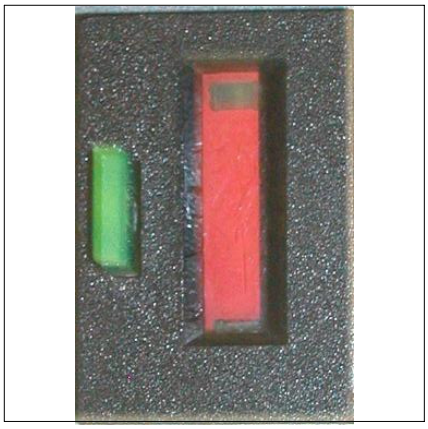
■ **WIC1**: Stand alone protection relay (without earth fault detection).
Option: with earth fault detection.



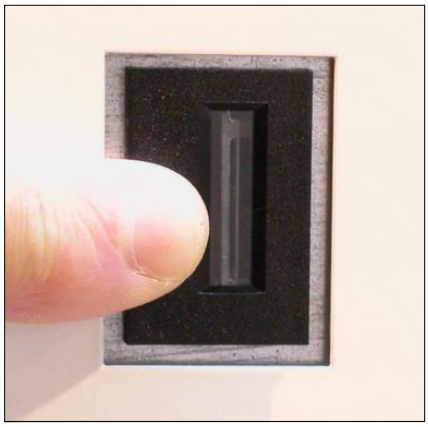
■ **DPX-1**: Stand alone protection relay with earth fault detection and LED indicator:
- Flashing green LED: OK
- Permanent green LED: problem with the relay
- Permanent red LED: detection of fault current.

16.5 Fault indicator WI1-SZ5

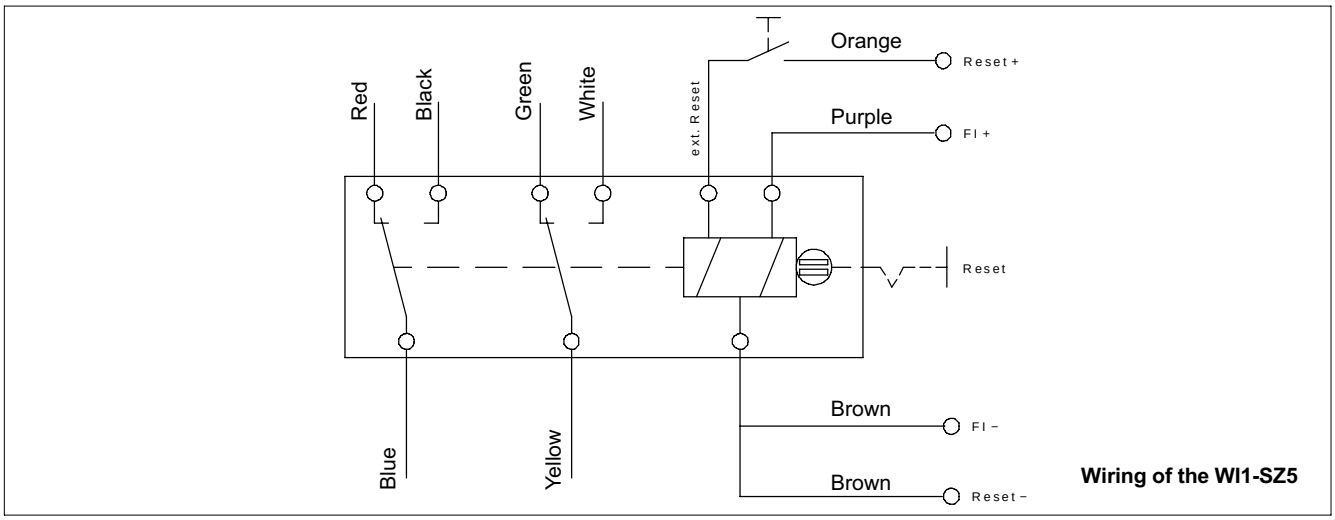
■ Normal indicator view (no fault).



■ Indicator showing a fault (red).



■ Push the green button to reset the indicator.



Wiring of the WI1-SZ5

17 Commissioning

17.1 Reminder

Prior to dispatch, FBX Switchboards are mechanically and electrically tested.

Also check the leaktightness of the room, the cable troughs, ventilation, etc.

17.2 Carry out an inventory of all tools and accessories on completion of the work

Recover, verify and tidy away all assembly tools and objects not required in the switchboard.

Store away, in their respective location, the operating accessories for the switchboard.

Attach the FBX technical notice in a visible location within the room.

17.3 Pre-commissioning information

Respect the General Safety Instructions booklet for Electrical Applications and the particular regulations for the network concerned with regard to locking-out procedures.

Check and record the serial numbers and identifying marks on equipment and switchgear while they are accessible.

Refer to the drawings and diagrams supplied with the equipment. They describe the functionalities employed to carry out the level of operation required.

17.4 Principle pre-commissioning checks

Visual inspections	Date	Remarks	Signature
- Ensure there are no foreign bodies inside the switchboard - Check the external appearance (no signs of blows, scratches on the paintwork) -- > carry out touch-up repairs if needed - Check the conformity with the Protection Index (leaktightness of the Functional Units, various blanking panels, etc.) - Ensure that the insulating blanking plugs are fitted on extendable switchboards			

Tightening torque verifications	Date	Remarks	Signature
- Inspection of mechanical tightening torques, (assemblies, electrical connections, earthing circuits, cables, etc.)			

Operational verifications	Date	Remarks	Signature
- Repeat a couple of operations to check the functioning of the system for the circuit breaker and the earthing switch - Verify, after each operation, the status of the position indicator			

17.5 Energizing the FBX switchboard

⚠ CAUTION

Before commissioning, the load-break switches, disconnectors and earthing switch must all be `open'.

When the switchboard incoming feeders are energise the voltage present indicators should flash or come on (depending on the equipment).

17.6 VDS – Voltage Detection Systems

HR System (High Resistance)

The voltage (or total absence of voltage) is detected by a separate VDS – in accordance with IEC61243-5.

NOTICE

The three phases must, in all cases, be verified.

NOTICE

Use the recommended voltage present indicators.

- The measurement plugs are fitted to each function of the FBX switchboard and blanked off during normal operations.

- Horstmann Luminous Indicators (HR-ST).

- Luminous Indicator (DSA2).

IVIS (Intelligent Voltage Information System)

The IVIS, with its integrated indicators, can be used to check for the absence of voltages in accordance with IEC61243-5.

The lightning bolt symbol signifies that a voltage is present.

The IVIS unit does not require initial operating tests prior to detecting a voltage.

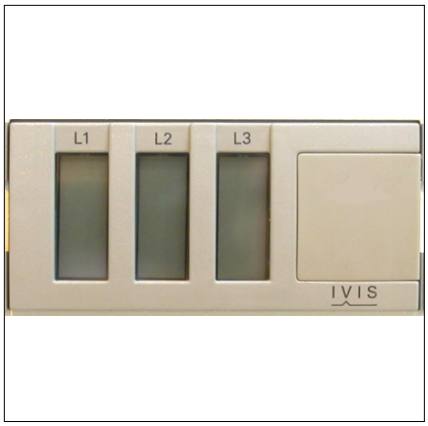
The IVIS unit does not need an external power source.

It is an electronic unit in a sealed box, insensitive to climatic conditions and completely maintenance-free.

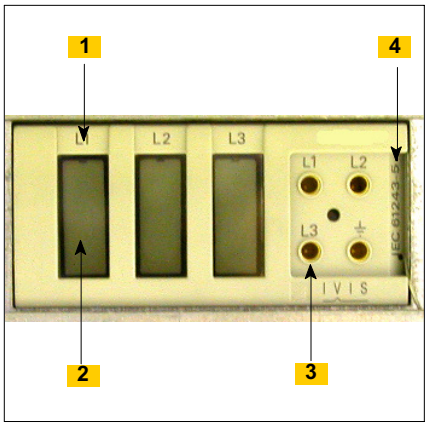
For phase comparison, use an MS100 device.

Refer to the corresponding manual for the use of the IVIS (See § 2.2).

Verification of phase concordance (for IVIS)



- IVIS display



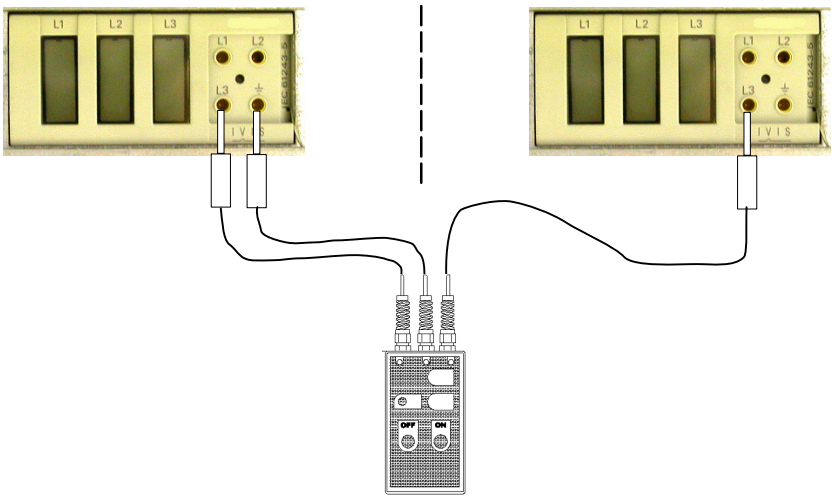
- Lift off the small protective cover to gain access to the terminals (**3**) and to visualise the indication of the standard (**4**).

This voltage indicator system is guaranteed in accordance with IEC61243-5 (**4**).

For each of the phases L1, L2 and L3 [**1**] there is a corresponding indicator in the form of a bolt of lightning [**2**].

For each phase there is a connector terminal [**3**], accessible from the front panel, used to connect the phase comparator.

- Ensure the proper phase balance with the aid of an MS100 device. If the phases seem to be out of balance, check the cable connections.



Capdis KRIES

17.7 VPIS (Voltage Present Indicating System)

The VPIS unit is an integrated voltage detection system in accordance with IEC61958. Used to indicate that a voltage is present across the cables.

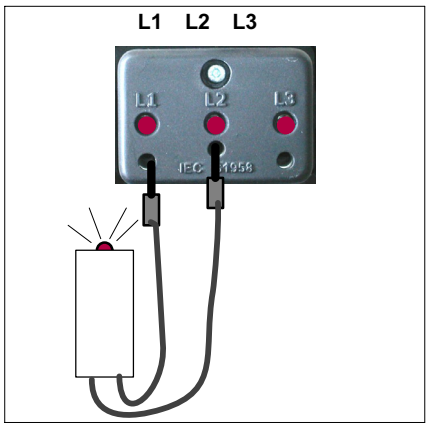
⚠ CAUTION

This equipment cannot be used to check for an absence of voltage.

Voltage Present Indications verifications with a standard unit

- Standard unit (15-20 kV).

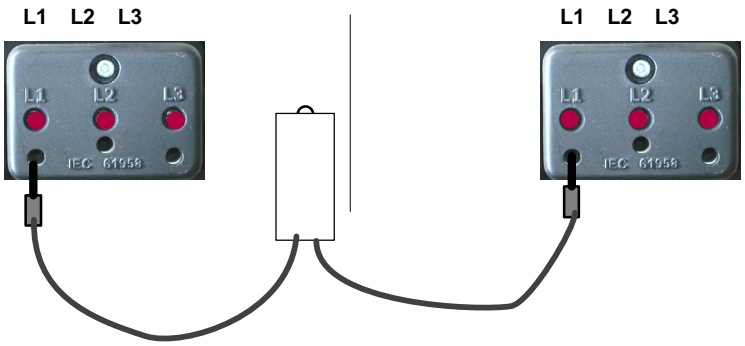
- Phase concordance can be verified with a specific phase comparator.



- Check the comparator between 2 phases of a voltage present indicator light: The lamp should light up.

Check phase concordance

- Connect the now verified comparator between the L1 phases on the two switchboard incoming feeder functions.
- Phases balanced:
  The lamp on the unit is extinguished.
- Phases out of sequence:
  The lamp on the unit is lit.
- Repeat operation for L2 and L3.



Voltage Present Indications verifications with a Kries unit

- VOIS + (Kries) unit.

- Kries Phase Comparator.

- See the manual provided with the comparator for operating instructions.

17.8 Starting up the switchboard

Close the breaking devices on the `Incoming feeder' functions.

Close the load-break switch on the `Transformer outgoing feeder' function.

Refer to the Operating manual (See § 2.2).

17.9 Short-circuit indicators (optional)

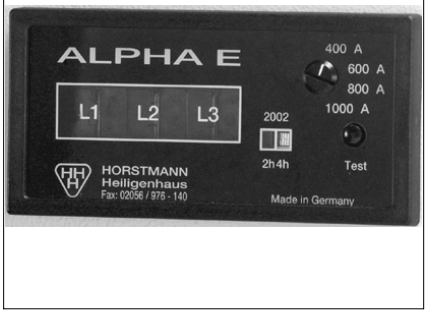
The switchboard may be fitted with short circuit indicators.

In principle, there are two possible uses for short-circuit indicators:
- The short circuit indicators are attached directly to the HV cables. In this case, the cable compartment must be fitted with an inspection port (optional).
- The short-circuit indicators are integrated into the LV compartment. The three phases are displayed separately.

The short circuit indicators can be used with various functions:
- with manual reset,
- with automatic reset,
- with remote reset,
- with remote visualization contact,
- with earthing fault indicator.

NOTICE

Refer to the instructions supplied by the manufacturer of the short circuit indicators.



- Horstmann short circuit indicator.

18 Notes

If you have any comments on the use of this document or on the use of the equipment and services that are described in it, please send us your remarks, suggestions and wishes to:

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